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Project F-71-R-17

REGIONAL FISHERIES MANAGEMENT INVESTIGATIONS

Job No. 4-a. Region 4 Mountain Lakes Investigations
Job No. 4-b. Region 4 Lowland Lakes and Reservoirs Investigations
Job No. 4-c. Region 4 Rivers and Streams Investigations Job No. 4-d.
Region 4 Technical Guidance

By

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JOB PERFORMANCE REPORT

State of: **Idaho** **Name:** **Regional Fishery Management Investigations**

Project No. **F-71-R-17** **Title:** **Region 4 Mountain Lakes Investigations**

Job No: **4-a**

Period Covered: **July 1, 1992 to June 30, 1993**

ABSTRACT

Gillnetting in Baker Lake in July 1992 sampled 11 brown trout Salmo trutta, 52 cutthroat trout Oncorchynchus clarki, 4 rainbow trout O. mykiss, 5 rainbow x cutthroat hybrids, and 6 golden trout O. aguabonita. The continued presence of species other than golden trout appear to be hampering the development of the golden trout broodstock program at the lake. Removal of non-golden trout through gillnetting and angler harvest is recommended.

An angler survey at Lake Cleveland on July 30, 1992 found the catch rate for hatchery rainbow trout to be 0.3/h. Angler use was high with 44 hours of use being documented during 4 hours of survey.

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OBJECTIVE

To maintain information for fishery management activities and decisions for mountain lakes.

METHODS

Fish populations in alpine lakes were sampled with Swedish-made Lundgrens Type A lightweight multi-filament gill nets. These are sinking nets, measuring 1.5 m wide, with six 7.6-m panels, and the following bar mesh sizes: 46, 38, 33, 30, 25, and 19 mm. Nets were set and retrieved using a small inflatable raft. Fish data analysis included calculating length-at-age, length frequencies, and species composition. Length-at-age was calculated from a least-squares linear regression between scale radius and fish total lengths.

Bathometric profiles were taken with a Lowrance Fish Lo-K-Tor depth sounder at various places on the lake from the raft. Lake area and elevation were estimated from a U.S. Geological Survey 7.5-minute topographic map.

Water quality was measured in situ for dissolved oxygen and temperature profiles and from mid-lake surface samples for specific conductance, alkalinity ($CaCO_3$), and total hardness. A Yellow Springs Instruments Model 57 oxygen meter with a 30-m cord was used for temperature and dissolved oxygen profiles, specific conductance was measured with a Sulu bridge conductivity meter, and alkalinity ($CaCO_3$) and total hardness was measured with a HACH kit the day after collecting the sample.

RESULTS

Baker Lake

Baker Lake is a high mountain cirque lake located at the headwaters of Baker Creek (SE 1/4, SEC 9, T4N, R15E), a tributary to the upper Big Wood River. It is approximately 4.5 hectares in surface area and 2,681 m in elevation, with a maximum depth of 14 m (Figure 1). The lake is oligotrophic with a combined alkalinity of 26 mg/l, specific conductance of 47 pmhos/cm^2, total hardness of 37 mg/1, and Secchi visibility greater than 14 m, as measured on July 14, 1992. Surface water temperature at 0830 hours was 10°C. The lake is fed by underwater springs and snow melt and has an intermittent inlet. The outlet forms a small stream which flows about 150 m over boulders and rubble with small pockets of gravel before descending down a steep cascade. No definite barrier was observed, but it is unlikely that fish can migrate up to the lake from the lower drainage. Access to the lake is by hiking 2 km up a good trail from the end of the Baker Creek road.

Three gill nets were set overnight in Baker Lake on July 13, 1992. Fish species and numbers sampled included 11 brown trout Salmo trutta, 52 cutthroat trout Oncorhynchus clarki, 4 rainbow trout O. mykiss, 5 rainbow x cutthroat hybrids, and 6 golden trout O. aguabonita (Table 1). Back-calculated length-at-age was determined for the brown and cutthroat trout (Table 2). It is not known when or how the brown and rainbow trout were first introduced into the lake. Possible sources for the rainbow trout included planting errors at release. The brown trout were most likely from either a hatchery planting error or from unauthorized private releases. Since two year classes of brown trout were collected, it is highly probable that they are from the latter source.

Shortly after ice-off in the spring, the Department installed a trap in the outlet stream about 5 m downstream from the lake to capture spawning golden trout. This trap, in conjunction with a rock gabion, restricts adult fish from

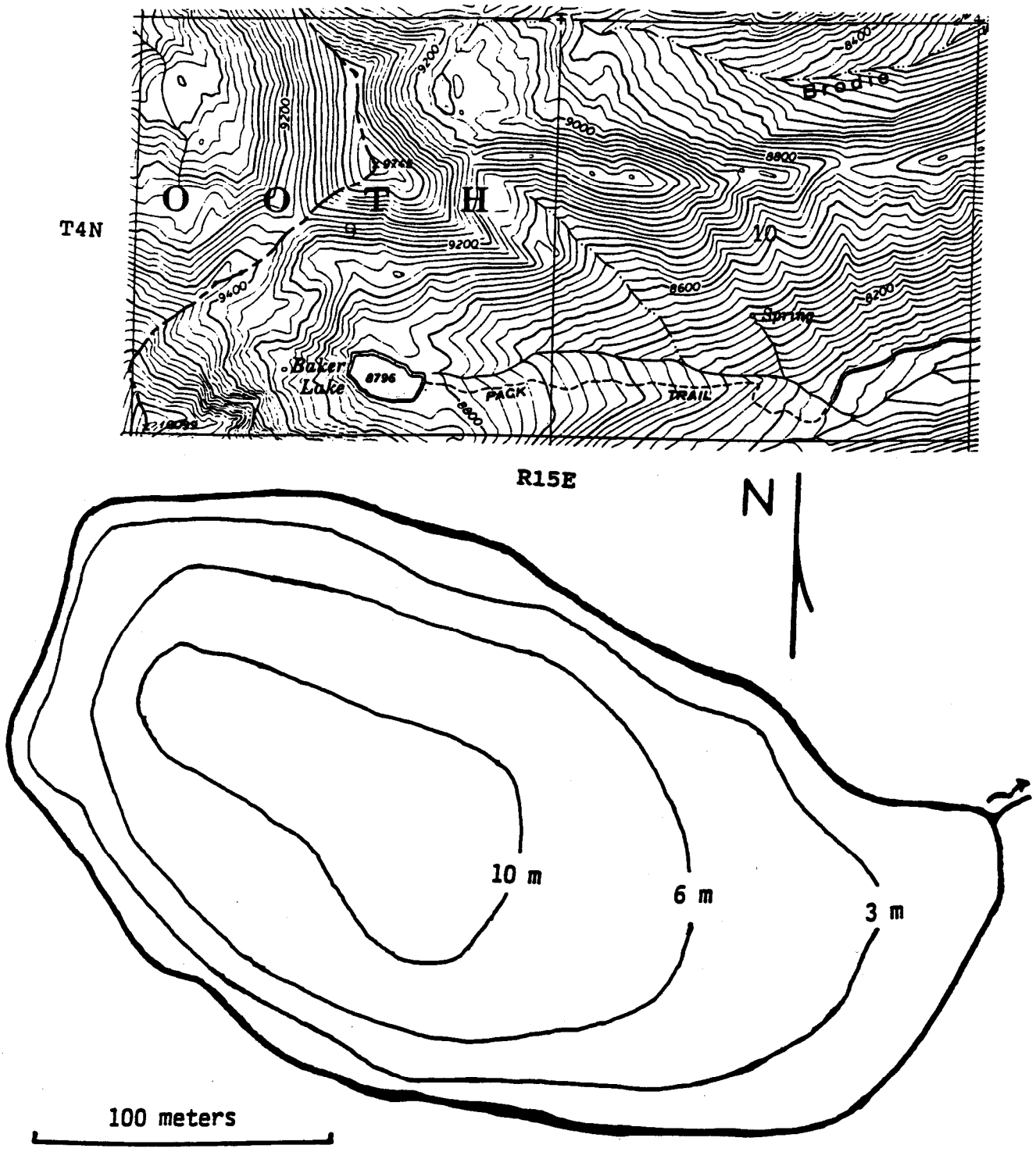


Figure 1. Map depicting location of Baker Lake and bathometric profile.

Table 1. Length frequency of fish sampled in gill nets from Baker Lake on July 13-14, 1992.

Total length (mm)	Brown trout	Cutthroat trout	Golden trout	Rainbow trout	RBT x CT Hybrid
100					
110					
120					
130					
140					
150		1			
160					
170		2			
180					
190		1			
200	3	1			
210		2			
220		2	2		
230		1			
240	1	6			
250		5			
260	1	1			
270	1	3			
280		1			
290	1	6			
300		1			
310	1	2			
320		3			
330	1	3			
340		5			
350		3			
360		1			
370					
380		2			
390					
400	1				
410					
420					
430					
440					
450	1				
460					
470					
480					
490					
500					
Total	11	52	6	4	5
Mean	291	283	224	268	341

Table 2. Back-calculated length-at-age (mm) for cutthroat and brown trout sampled at Baker Lake, July 1992. (Standard deviation in parentheses.)

Year class	Number of fish	Mean length at annulus 1	2	3
		Cutthroat trout		
1991	1	128		
1990	11	137 (28.7)	202 (36.5)	
Weighted average length		136	202	
		Brown trout		
1990	9	111 (7.8)	238 (17.5)	
1989	2	125 (16.3)	234 (45.0)	374 (24.6)
Weighted average length		114	237	374

migrating downstream from the lake after installation. However, numerous young-of-the-year (YOY) from either shoreline or stream spawning were observed at the outlet upstream of the barrier during July 1992.

Since 1987, Baker Lake has been stocked with age 1+ golden trout from Wyoming and Montana sources, and managed as a broodstock lake (Table 3). Fishing regulations since 1988 have restricted fishing to catch-and-release to protect the golden trout brood fish. The brood trap has been set up and operated at the outlet since 1988 to collect spawning golden trout and to remove spawning cutthroat trout. Efforts to artificially spawn golden trout have resulted in few eyed eggs to date. The current lack of success of Baker Lake as a golden trout brood lake is probably due to the presence of other fish species. In 1987, it was felt that natural reproduction in the lake was insignificant, and that cutthroat trout would disappear with *non-stocking* and trapping; however, the current trout population in the lake shows that this is not the case.

If Baker Lake is to be managed as a golden trout broodstock lake, all other species of trout should be removed to eliminate competition, and also to eliminate the chances of rainbow or cutthroat trout hybridizing with golden trout. Chemical eradication of all fish in the lake would be expensive and has some potential risk (biological and public acceptance) for the high quality Big Wood River fishery downstream. Other recommended methods to at least remove most of the undesirable fish include: allowing the harvest of non-golden trout by anglers, the intensive use of gill nets, and improving the outlet barrier to eliminate the return of YOY trout back into the lake. Considerations could also be given to selecting another lake as a golden trout broodstock lake.

Lake Cleveland

Lake Cleveland is a 2.5-hectare high mountain cirque lake located in the Albion Mountains at 2,514 m in elevation, approximately 20 km southeast of Burley, Idaho (Sec 4, T12S, R24E) (Figure 2). The lake receives water from a small perennial stream which is part of the headwaters of Marsh Creek, a tributary to the Snake River upstream of Burley. The outflow has been modified with a small dam and headgate to store and provide water for downstream irrigation uses. A good road, parking area, and campground are provided for public use. Current fishing regulations prohibit the use of motors while fishing from boats. The lake is currently managed with the stocking of put-and-take rainbow trout.

A physical, limnological, and angler survey was made on Thursday July 30, 1992. The lake appears to receive high public usage for camping and fishing purposes, with a total of 43.5 h of angler effort in four daylight hours surveyed. The catch rate was 0.3 hatchery rainbow trout per hour with no other species observed. Maximum depth was approximately 12 m and average depth approximately 5 m. Alkalinity measured 24 mg/l as $CaCO_3$, specific conductance measured 20 pmhos/cm, total hardness 22 mg/l, and Secchi visibility depth 3.9 m. Temperature and dissolved oxygen profiles were taken near the dam and mid-reservoir between 1200 and 1330 hours (Figure 3).

RECOMMENDATIONS

Continue to remove non-golden trout from Baker Lake with gill nets and/or by allowing selective harvest by anglers.

If the golden trout broodstock program does not show significant results by 1996, discontinue the program.

Table 3. Baker Lake stocking history from 1960-1992.

Year	Species'	Size Class	Number	Source	Marks
1960	GN	9,900/kg	2,250	-	-
1962	CT	2,640/kg	2,400	-	-
1964	CT	8,800/kg	3,000	-	-
1967	CT	5,958/kg	3,060	-	-
1969	CT	1,464/kg	2,829	-	-
1971	CT	7,333/kg	2,500	-	-
1973	CT	2,394/kg	2,720	-	-
1976	CT	845/kg	384	-	-
1979	CT	4,400/kg	1,500	-	-
1982	CT	2,820/kg	1,500	-	-
1985	CT	770/kg	1,050	-	-
1987	GN	127-152 mm	1,500	Wyoming	None
1989	GN	127-152 mm	1,180	Wyoming	None
1990	GN	127-152 mm	600	Wyoming	None
1991	GN	76-152 mm	581	Montana	Ad clip
1992	GN	76-152 mm	630	Wyoming	LV clip

'CT - cutthroat trout, GN - Golden trout

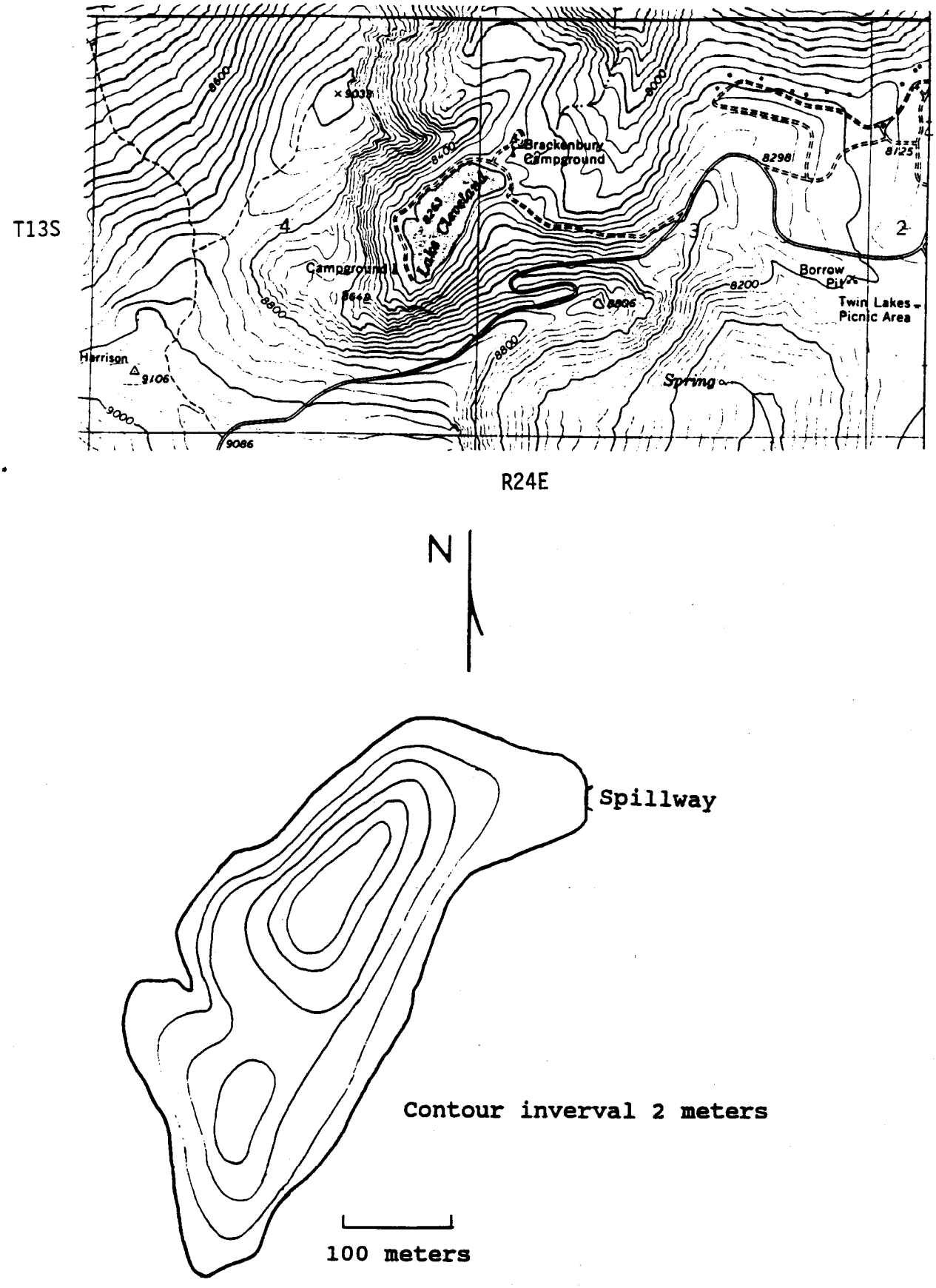
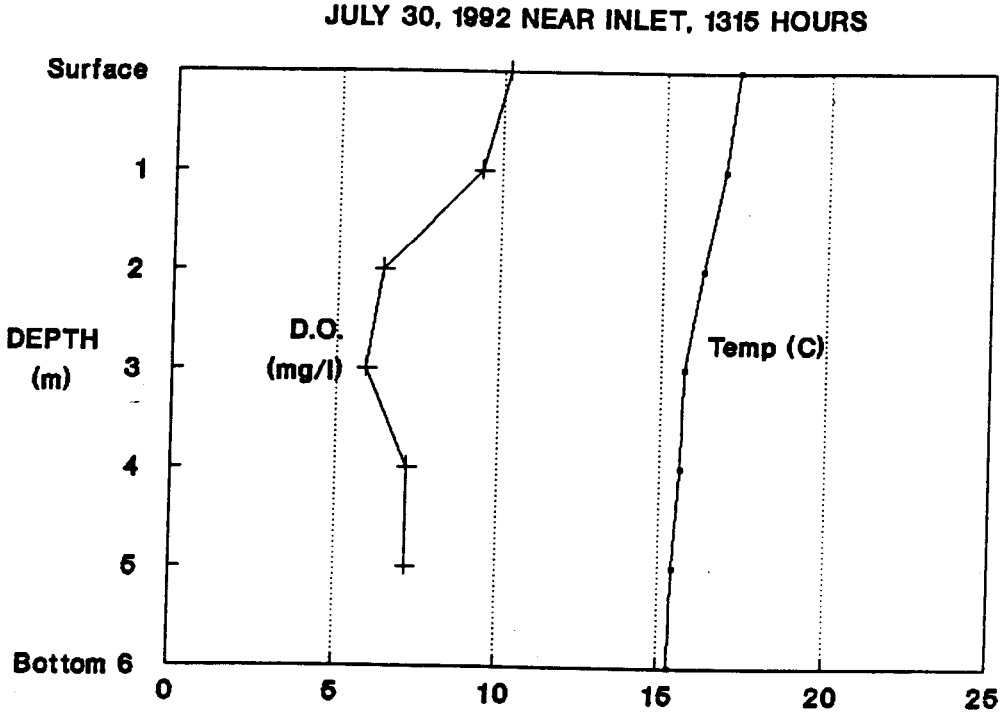


Figure 2. Map depicting location of Lake Cleveland and bathometric profile.



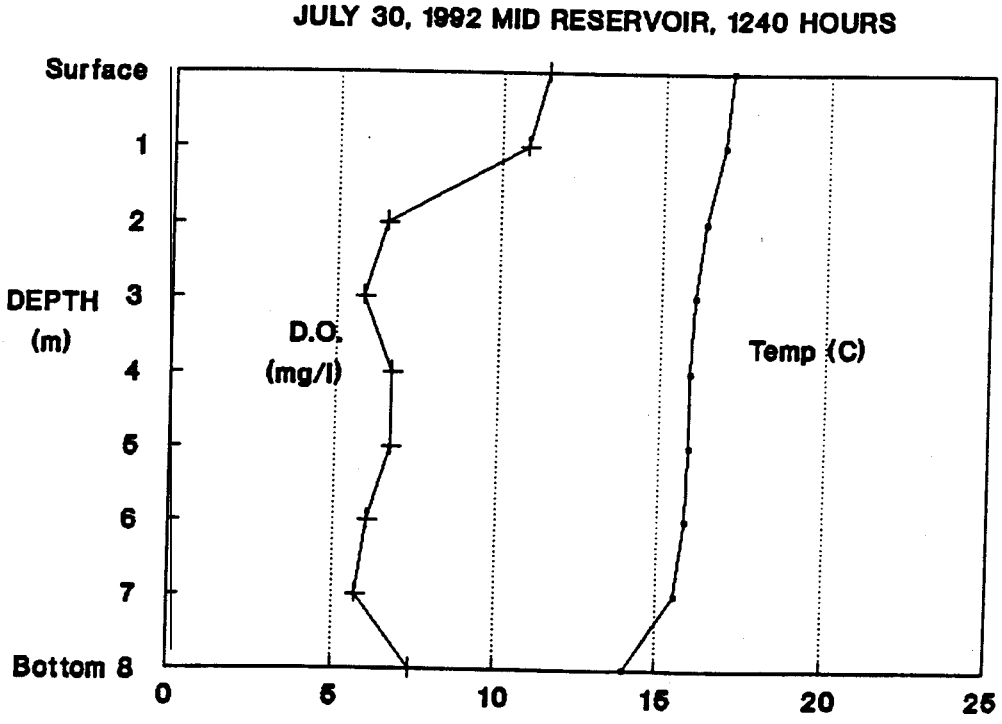


Figure 3. Daytime temperature and dissolved oxygen profiles near the inlet and mid-reservoir at Lake Cleveland on July 30, 1992.

ACKNOWLEDGEMENTS

Fishery technicians Christie Cockerham, Chris Wright, and Robert Dischinger collected field data and assisted with data summarization and analysis. Doug Young from Hayspur Hatchery and Roger Olson, District Conservation Officer, assisted with sampling at Baker Lake.

JOB PERFORMANCE REPORT

Name: **Regional Fishery Management Investigations**

State of: **Idaho** **Project**

Title: **Region 4 Lowland Lakes and Reservoirs Investigations**

No: **F-71-R-17**

Job No.: **4-b**

Period Covered: **July 1, 1992 to June 30, 1993**

ABSTRACT

Numerous Region 4 reservoirs dropped to minimum pool levels as a result of six consecutive years of below-average annual precipitation eliminating boating access at many sites.

Fish were sampled on 11 lowland lakes, ponds, and reservoirs in Region 4. Gillnetting on Anderson Ranch Reservoir sampled prespawning adult kokanee Oncorhynchus nerka averaging 398 mm in total length. A spawning survey indicates a 135% increase in spawner escapement from the previous three years from the reservoir. Blair Trail Reservoir and Bruneau Duck Pond were sampled with one unit of effort in June 1992. Results indicate the presence of a large population of brown bullhead Ameiurus nebulosus and stunted bluegill Lepomis macrochirus in Blair Trail Reservoir. Bruneau Duck Pond results indicate a fish community dominated by common carp Cyprinus carpio, with brown bullhead and black crappie Pomoxis nigromaculatus the only game fish sampled. Dog Creek (Irving) Reservoir was electrofished in June and July 1992, with largemouth bass Micropterus salmoides, bluegill, and yellow perch Perca flavescens sampled. Proportional Stock Densities (PSDs) were 79 for bass and 8 for bluegill.

Little Wood Reservoir creel survey results for the period between June 1 and December 13, 1992 estimated 250 angler hours of effort per hectare, with a catch rate of 0.61 fish/h and a 31.5% return-to-the-creel of rainbow trout O. mykiss planted as catchables. Magic Reservoir creel survey results for the same period estimate 300 h/hectare of angler effort, with a 0.46 fish/h catch rate and a 27.6% return-to-the-creel of rainbow trout planted as catchables.

Roseworth (Cedar Creek) Reservoir was treated with Rotenone after one unit of sampling effort resulted in a sample of 98% nongame fish species. Rainbow trout catchables and fingerlings were restocked in spring of 1993.

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OBJECTIVE

To maintain information for fishery management activities and decisions for lowland lakes and reservoirs.

METHODS

General fishery data in lakes and reservoirs were collected by electrofishing, variable mesh gill nets, trap nets, beach seining, creel surveys, and spawning redd counts. Electrofishing was done with either a Smith-Root model SR-18 electrofishing boat equipped with a model 5.0 pulsator or a drift boat equipped with a Coffelt VVP-15 Electrofisher powered by a Honda model 5000 generator. A crew of one driver/operator and two natters were used with either setup. Gill nets used were 38 m x 1.8 m, with variable bar mesh sizes ranging from 19 mm to 64 mm. Trap nets used had a 23-m lead, 0.9 m x 1.8 m frame, crowfoot throats on the first and third of five hoops, 19-mm bar mesh, and were treated black. Seining was done with a 15.2 m, 6.2-mm square mesh beach seine. For core population assessments, fish were sampled by electrofishing, gillnetting, and trapnetting in accordance with Idaho Department of Fish and Game (IDFG) recommended techniques of 1992. Intensive creel surveys involved stratifying the entire time period into 28-day intervals, which were in turn stratified into either weekend day or weekday types. Two of each day type were randomly selected from each interval for survey dates. On the day of the survey, a creel census clerk drove to the reservoir, counted and classified all fishermen as boat, shore, or ice anglers. After the initial fisherman count, the creel census clerk interviewed as many of the fishermen as possible and inspected their catch. Harvested catch were inspected for species identification, fin erosion, total length, and marks. Fishermen were also asked how long they had been fishing that water body on the day of the interview and the number and species of fish caught and released. After the interviews, and at least two hours after the initial count, another total angler count was made for the entire reservoir. Creel survey data analysis was done with methods following the Idaho Department of Fish and Game Creel Census System technical reference manual developed by McArthur et al. (1992).

Fish data analysis included calculating total length-at-age, total length frequencies, estimate of total population and densities, and species composition. Total length-at-age was calculated from a least-squares linear regression between scale radius and fish total lengths (Mackay et al. 1990). Total population was estimated with the adjusted Petersen mark-recapture method where fish were captured, marked, and released in a single run, then a census was taken in a following run for a ratio estimate (Ricker 1975). Proportional Stock Densities (PSD) for largemouth bass Micropterus salmoides and bluegill Lepomis macrochirus and relative stock density (RSD) for largemouth bass 380 mm (15 in) and longer (RSD-15) was estimated for waters where at least 30 fish of those species were sampled (Anderson and Gutreuter 1983).

Water quality was measured in situ for dissolved oxygen and temperature profiles and from a mid-lake surface sample for specific conductance, alkalinity ($CaCO_3$), and total hardness. A Yellow Springs Instruments model 57 oxygen meter with a 30-m cord was used for temperature and dissolved oxygen profiles. Specific conductance was measured with a Sulu bridge conductivity meter, and alkalinity ($CaCO_3$) and total hardness were measured with a HACH kit the day after collecting the sample.

RESULTS AND DISCUSSION

Anderson Ranch Reservoir

In 1992, water volume within the reservoir dropped to a record low level since initial construction and filling in 1946. Drought conditions persisting since 1986 dewatered all developed boat ramps by midsummer of 1992, limiting angler use of the reservoir. As of March 8, 1993 the reservoir level was down 58 vertical meters from its maximum elevation (Bureau of Reclamation, personal communication, 1993). Total reservoir volume was 48.5 cubic hectometers (39,300 acre-feet), which is 8% of total capacity.

Two multiple mesh gill nets were set overnight in the reservoir near the mouth of the South Fork Boise River on April 29, 1992 to look for bull trout Salvelinus confluentus and fall chinook salmon Oncorhynchus tshawytscha (Figure 1). Fish sampled include 4 chiselmouth chub Acrocheilus alutaceus, 1 hatchery rainbow trout O. mykiss, 9 largescale sucker Catostomus macrocheilus, 45 northern squawfish Ptychocheilus oregonensis, and 1 mountain whitefish Prosopium williamsoni. Subsamples were taken for total length measurements on sucker and squawfish (Table 1). Four gill nets with 8 cm and 10 cm bar mesh were set overnight near the mouth of the South Fork Boise River on August 28, 1992 for fall chinook salmon (Figure 1). These nets caught 1 largescale sucker Catostomus macrocheilus, 2 northern squawfish, and 228 adult kokanee O. nerka (Table 2). Kokanee averaged 398 mm in total length, with males averaging 400 mm and females averaging 390 mm (Figure 2). No chinook salmon or bull trout were sampled with any of the nets in 1992.

Spawning kokanee trend counts on the South Fork Boise River upstream of the reservoir to Smokey Creek were made by visually counting adult fish at 13 sites along the river (Table 3). These counts were made weekly from August 28 to October 7, 1992. Similar counts have been made at the same sites and time period since 1989. The total adult kokanee counted in 1992 was 769. Counts made in 1992 indicate an adult kokanee escapement of 135% of the average run size of the previous three years (Figure 3). No Anderson Ranch Reservoir adult kokanee were observed during counts in 1991, although approximately 50 adult kokanee transplanted from Deadwood Reservoir were observed near Little Smokey Creek that year. The 1992 run was also supplemented with 11,115 Deadwood Reservoir adult kokanee ranging in length from 200 mm to 250 mm, which were stocked into the South Fork Boise River at several sites upstream from Pine. These smaller fish were observed to be present in the river up to one week after planting, but not included in the trend counts.

Temperature and dissolved oxygen profiles were measured near the South Fork Boise River inlet and mid-reservoir near the Evans Creek inlet on July 3 and on September 30, 1992, and at the dam on July 3 (Figure 4).

Blair Trail Reservoir

Blair Trail Reservoir is a 6-hectare irrigation impoundment on Little Canyon Creek (Sec 21 & 28, T4S, R10E), approximately 11 km north of Glenna Ferry. It is managed as a bluegill and put-and-take rainbow trout fishery.

Fish were sampled on June 12 and June 16, 1992 with one unit of effort to obtain core population data. Fish collected included 143 brown bullhead Ameiurus nebulosus, 173 bluegill, 24 hatchery rainbow trout, and 1 speckled dace Rhinichthys osculus (Table 4). Bluegill scale analysis (n=5) indicates that most fish are growth stunted and do not reach stock length (80 mm) until at least

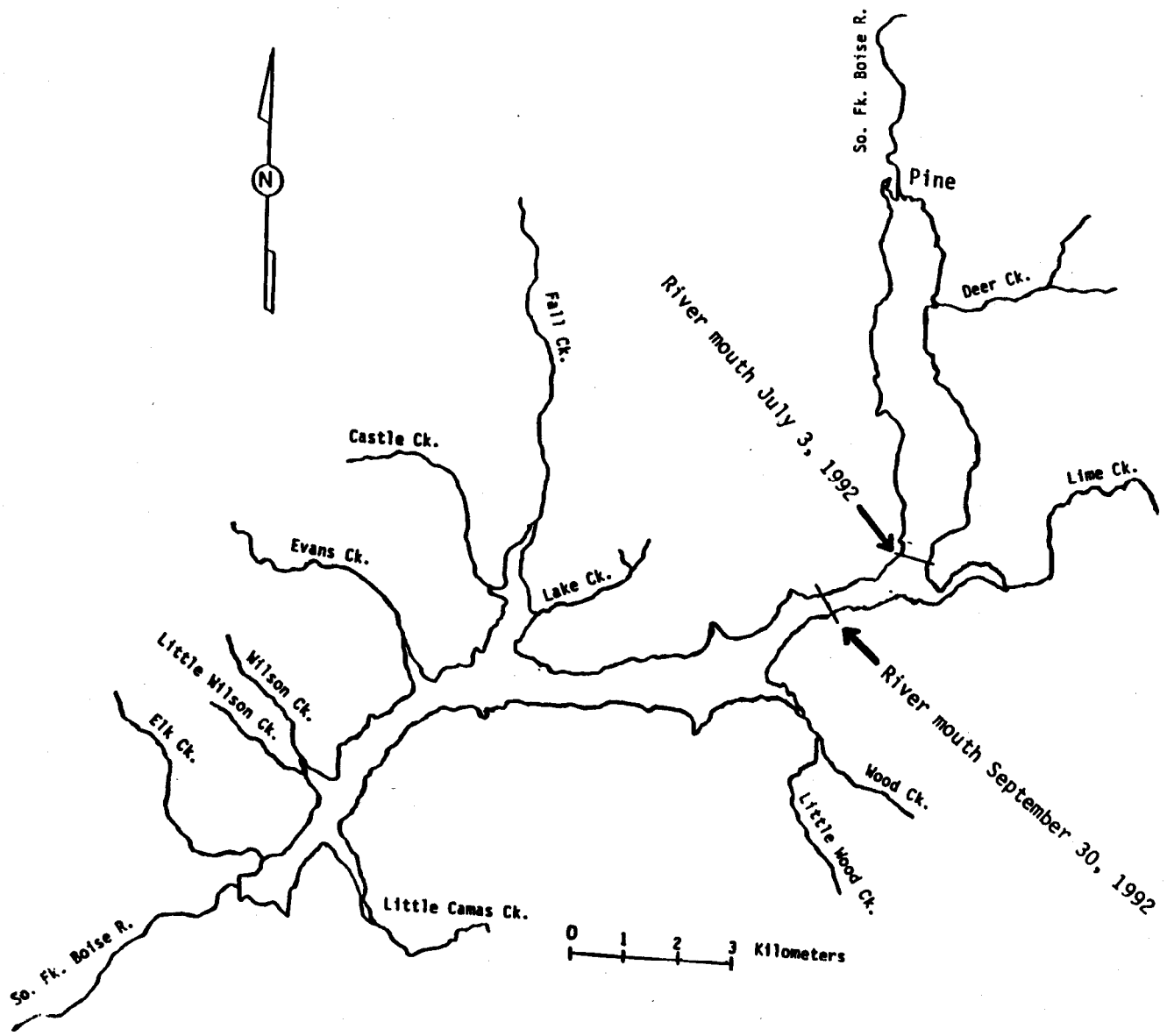

Figure 1. Map of Anderson Ranch Reservoir with tributaries and location of South Fork Boise River mouth, July 3 and September 30, 1992.

Table 1. Length frequency of fish sampled by gill nets in Anderson Ranch Reservoir on April 29, 1992.

Total length (mm)	Chiselmouth chub	Hatchery rainbow trout	Largescale sucker	Northern squawfish	Mountain whitefish
180					
190				1	
200					
210					
220				1	
230					
240					
250					
260					
270					
280					
290				1	
300	1				
310				1	
320				1	
330				2	
340	1			1	
350	2			1	1
360				1	
370				3	
380				1	
390				2	
400		1		2	
410			2	5	
420				3	
430				3	
440			1		
450				1	
460					
470			2	1	
480			1		
490					
500					
510					
520			1		
530					
540					
Total	4	1	7[a]	31[b]	1
Mean	341	405	459	379	357

[a]Two not measured.
[b]Fourteen not measured.

Table 2. Length frequency of fish sampled by gill nets in Anderson Ranch Reservoir on August 28, 1992.

Total length (mm)	Kokanee male	Kokanee female	Largescale sucker	Northern sauawfish
300				
310				
320				
330				
340	1	2		
350	9	5		
360	16	8		
370	21	5		
380	22	10		
390	31	5		
400	25	1		
410	16	2		
420	5	1		1
430	7	2		
440	5	1		
450	6	2		
460	4	3		1
470	8	1		
480	2			
490	1			
500	1			
510			1	
520				
Total	180	48	1	2
Mean	400	390	510	442

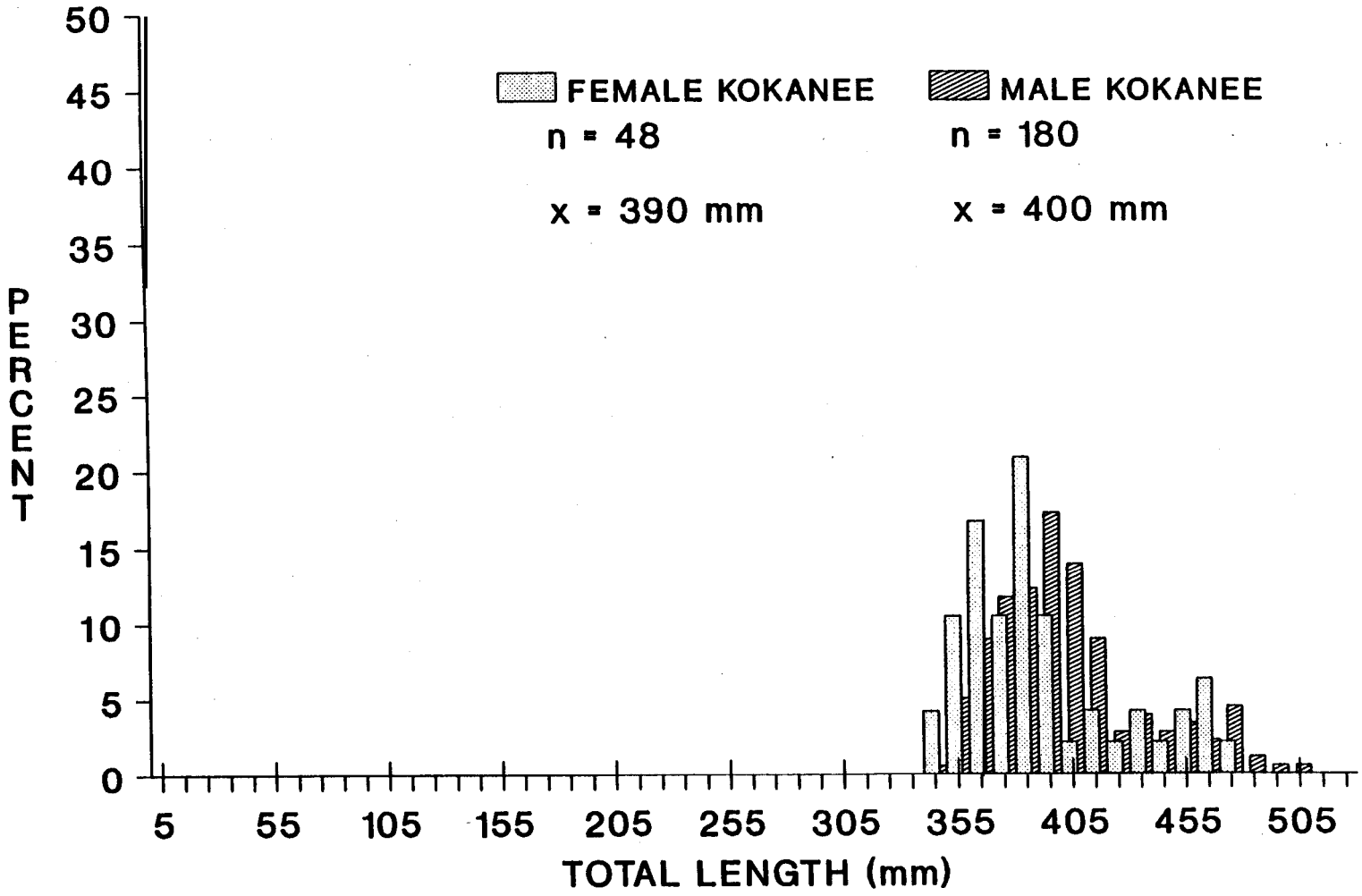

Figure 2. Length frequency of all adult kokanee gillnetted at Anderson Ranch Reservoir on August 28, 1992.

Table 3. Number of kokanee observed at selected sites on the South Fork Boise River during spawning ground surveys in 1992.

Location'	Aua 28	Sep 4	Sep 14	Sep 21	Sep 29	Oct 7
0	0	55	230	81	11	8
1	0	0	24	9	0	0
2	0	0	8	2	1	0
3	0	55	36	42	20	0
4	0	0	0	0	0	0
5	0	0	98	57	16	0
6	0	0	2	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	10	3	0
11	0	0	0	1	0	0
12	0	0	0	0	0	0
Total:	0	173	435	202	51	8

'Site Descriptions:
0 - Trap site: NW1/4, NE1/4, Sec 30, T2N, R10E
1 - Prospect hole: NW1/4, NE1/4, Sec 18, T2N, R10E
2 - Johnson hole: SWl/4, NE1/4, Sec 5, T2N, R10E
3 - Paradise hole: SW1/4, NW1/4, Sec 33, T3N, R10E
4 - Trinity Creek: SE1/4, SW1/4, Sec 9, T3N, R10E
5 - Section 10 hole: SE1/4, NE1/4, Sec 10, T3N, R10E
6 - Chaparral hole: NE1/4, NE1/4, Sec 12, T3N, R10E
7 - Ranger station hole: NE1/4, NE1/4, Sec 8, T3N, R11E
8 - Virginia Gulch Bridge: SE1/4, SE1/4, Sec 9, T3N, R11E
9 - Baumgartner hole: SE1/4, SE1/4, Sec 7, T3N, R12E
10 - Deadwood hole: NE1/4, NE1/4, Sec 22, T3N, R12E
11 - Big hole: SE1/4, SW1/4, Sec 18, T3N, R13E
12 - Smokey Creek hole: SE1/4, SW1/4, Sec 9, T3N, R13E

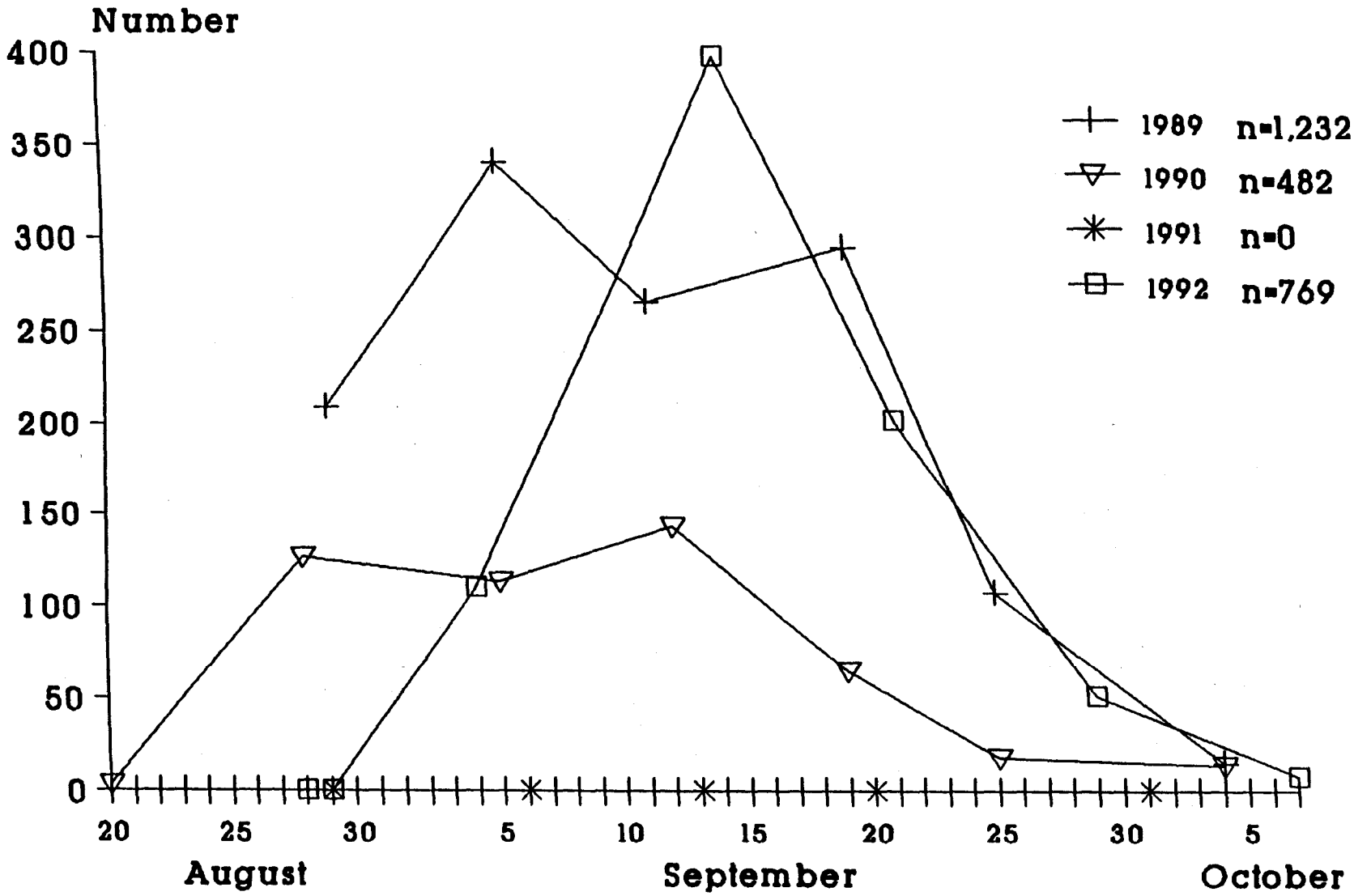

Figure 3. South Fork Boise River 1989-1992 spawning kokanee trend counts.

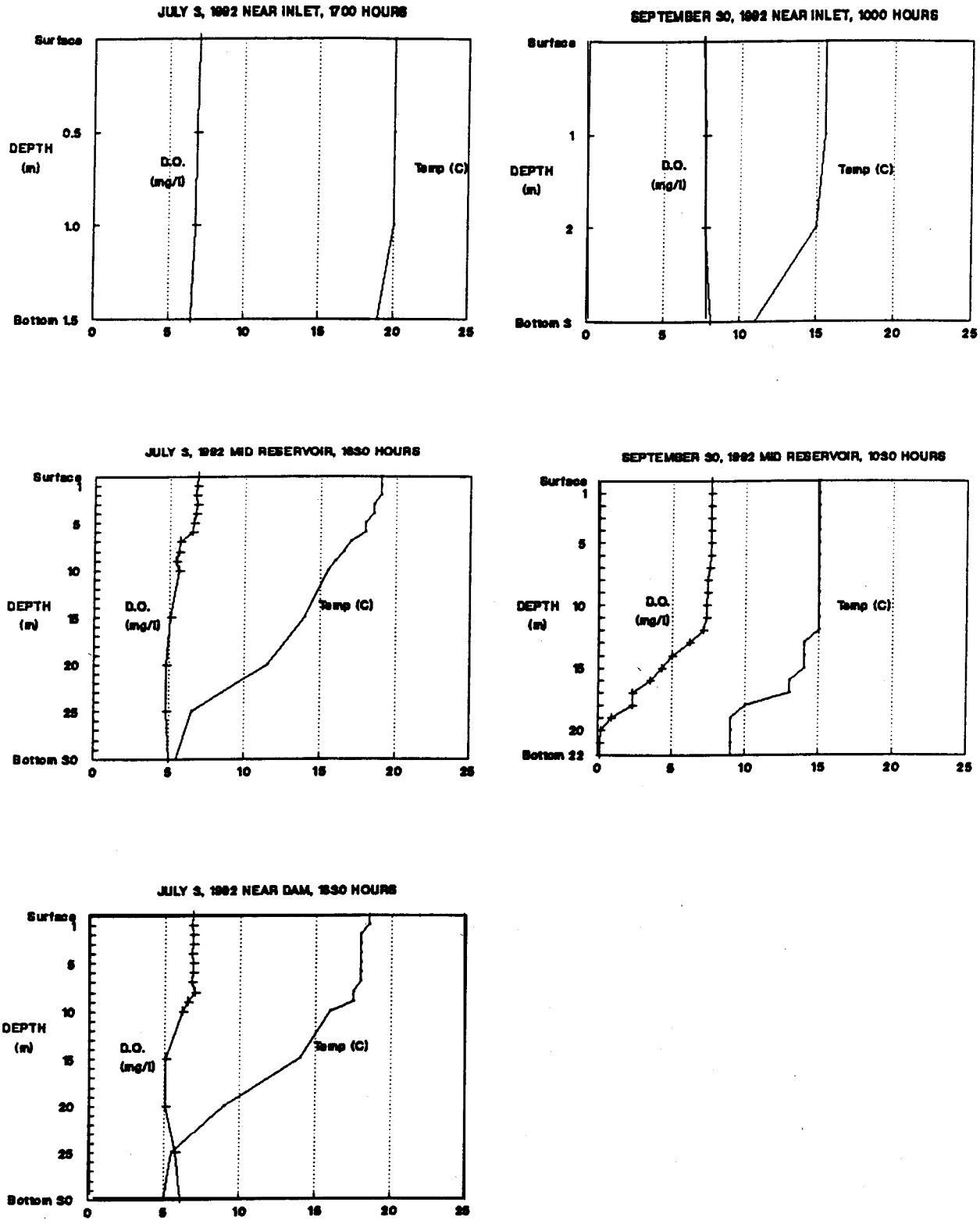

Figure 4. Temperature and dissolved oxygen profiles for three sites on July 3, 1992 and for two sites on September 30, 1992 at Anderson Ranch Reservoir.

Table 4. Length frequency of all hatchery rainbow trout and subsamples of brown bullhead and bluegill from Blair Trail Reservoir, utilizing one unit of effort in June 1992.

Total length (mm)	Brown Bullhead[a]	Blueaill[b]	Hatchery rainbow trout	Dace species
10				
20				
30				
40				
50				
60	2			
70	2	4		
80	1	1		1
90		5		
100	2	10		
110	4	4		
120	22	8		
130	22	5		
140	7			
150				
160	1			
170				
180			1	
190	1		4	
200			1	
210	1		3	
220	5		6	
230			3	
240				
250			5	
260 / 560			1	
Total	70	37	24	1
Mean	134	108	237	80

[a]Subsampled from a total of 143 brown bullhead.
[b]Subsampled from a total of 173 bluegill.

age 3+. A total of 135 bluegill were transferred out of this sample for stocking into the Rupert Gun Club Pond. Brown bullhead appear to be prevalent and are reported by some sportsmen to be a nuisance in this reservoir. Afternoon temperature and dissolved oxygen profiles were measured on June 11, 1992 (Figure 5).

Bruneau Duck Pond

Bruneau Duck Pond is a 17-hectare pond when full (Sec 1, T6S, R6E) on the east side of the C.J. Strike Wildlife Management Area. Water is provided to this pond through a pump and canal system on the Snake River. Maximum pond depth when full is approximately 3 m, with an average depth of approximately 1 m. This pond is managed primarily as a waterfowl nesting and hunting area with restricted access during the waterfowl nesting season.

Fish were sampled in late June with one unit of sampling effort to obtain core population data, although electrofishing was completely ineffective, possibly due to the high specific conductance (450 µmhos/cm) of the water. Scale samples were taken from black crappie Pomoxis nigromaculatus for length-at-age analysis. Fish species and numbers sampled included 41 black crappie, 42 brown bullhead, 4 largescale sucker, 235 common carp Cyprinus carpio, and 5 peamouth chub Mylocheilus caurinus. Mean total lengths were 118 mm for all black crappie sampled and 184 mm for all brown bullhead sampled (Table 5). Scale data analyses indicates that two year classes of black crappie were sampled (Table 6). It appears that black crappie in this pond reach stock length at age 1+ (130 mm).

The nongame species in this pond are most likely introduced when water is pumped into it from the Snake River. It is therefore unlikely that these fish could be kept out of the pond without modification of the pumping and intake system, such as screening.

Results of the temperature and dissolved oxygen profiles indicate that the pond is too shallow to stratify (Figure 6). Other water quality measurements taken included specific conductance (450 µmho/cm), alkalinity (140 mg/l as $CaCO_3$), total hardness (160 mg/1), and Secchi visibility depth (40-45 cm). Bruneau Duck Pond has fresh water pumped into it annually from the Snake River, but has no outlet.

Dog Creek (Irvin) Reservoir

Dog Creek (Irving) Reservoir was electrofished for 69.8 min on the evening of June 25 and for 63.7 min on the evening of July 2, 1992 with the Smith-Root electrofishing boat. Fish size and species composition and the success of the 1991 tiger muskie Esox lucius x E. masquinongy and channel catfish Ictalurus punctatus plants were evaluated. A total of 534 fish were sampled, with hatchery rainbow trout accounting for 3% of the total sample, largemouth bass 29%, bluegill 28%, yellow perch Perca flavescens 38%, brown bullhead 1%, and channel catfish less than 1% of the sample (Figure 7, Table 7). No tiger muskie were sampled. All largemouth bass at least 100 mm in total length were marked with an upper caudal punch on June 15, 1992 for a Petersen mark-recapture population estimate. There were only 4 bass recaptured on July 2, out of a sample of 63 greater than 100 mm, which is too low for an accurate estimate of population (Ricker 1975). Scale samples taken from 30 largemouth bass indicate they reach stock size (200 mm) at 2+ years of age and legal harvest size (305 mm) at 4+ years of age (Table 8).

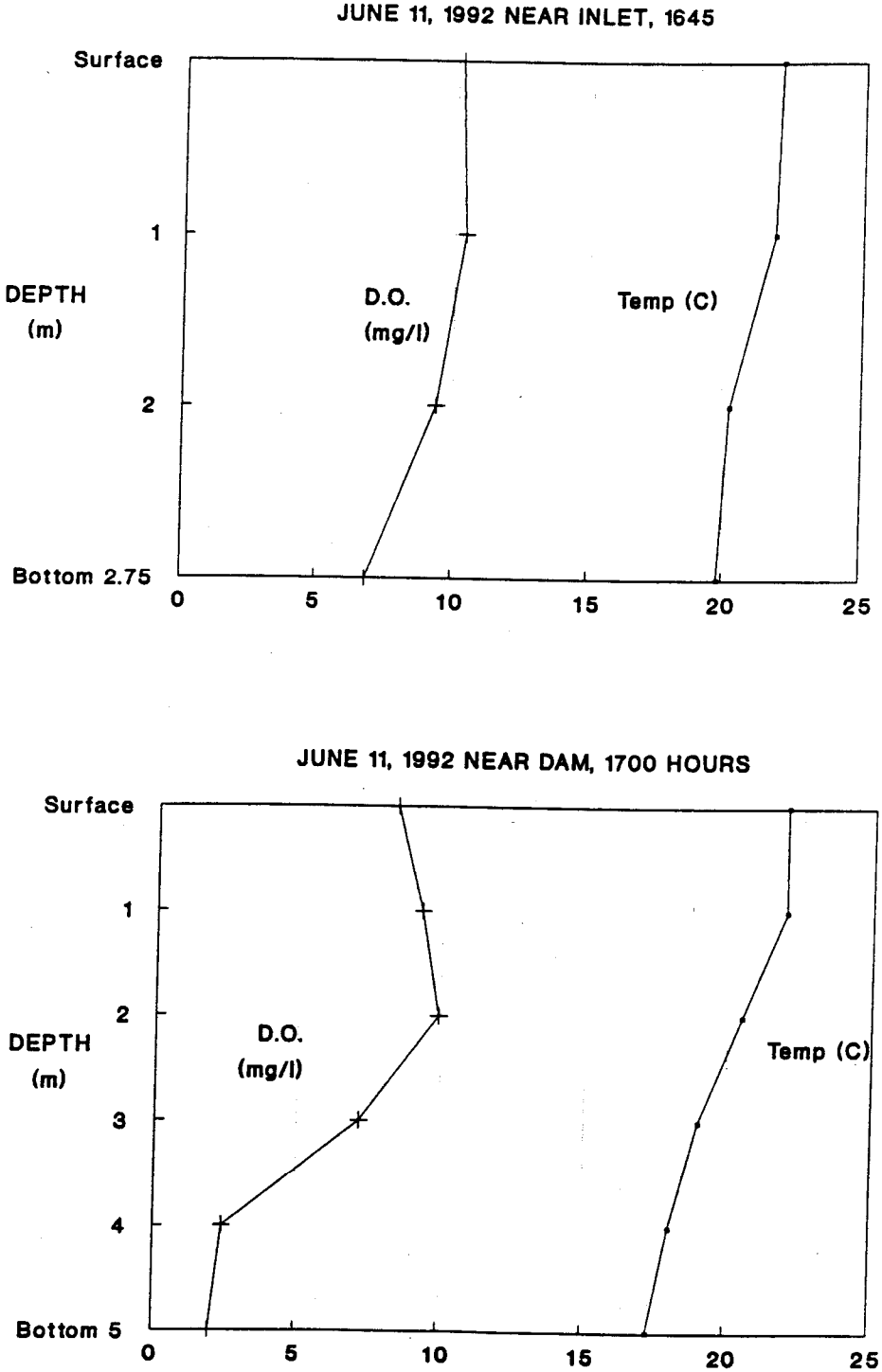

Figure 5. Temperature and dissolved oxygen profiles for two sites on June 11, 1992 at Blair Trail Reservoir.

Table 5. Length frequency of black crappie and brown bullhead sampled at Bruneau Duck Pond in late June 1992.

Total length (mm)	Black crappie	Brown bullhead
10		
20		
30		
40		
50		
60		
70		
80		
90	1	
100	15	
110	16	1
120	**5**	3
130		14
140		5
150		
160		
170		
180		
190	1	
200	1	
210		
220		1
230		4
240	2	3
250		3
260		5
270		1
280		2
290		
300		
310		
320		
330		
340		
350		
Total	41	42
Mean	118	184

Table 6. Back-calculated length-at-age (mm) of black crappied in Bruneau Duck Pond. (Standard deviation in parentheses.)

Year Class	Number of fish	Mean length at annulus 1	Mean length at annulus 2
1991	14	57 (5.5)	
1990	4	87 (5.5)	140 (37.5)
Weighted average length		63	140

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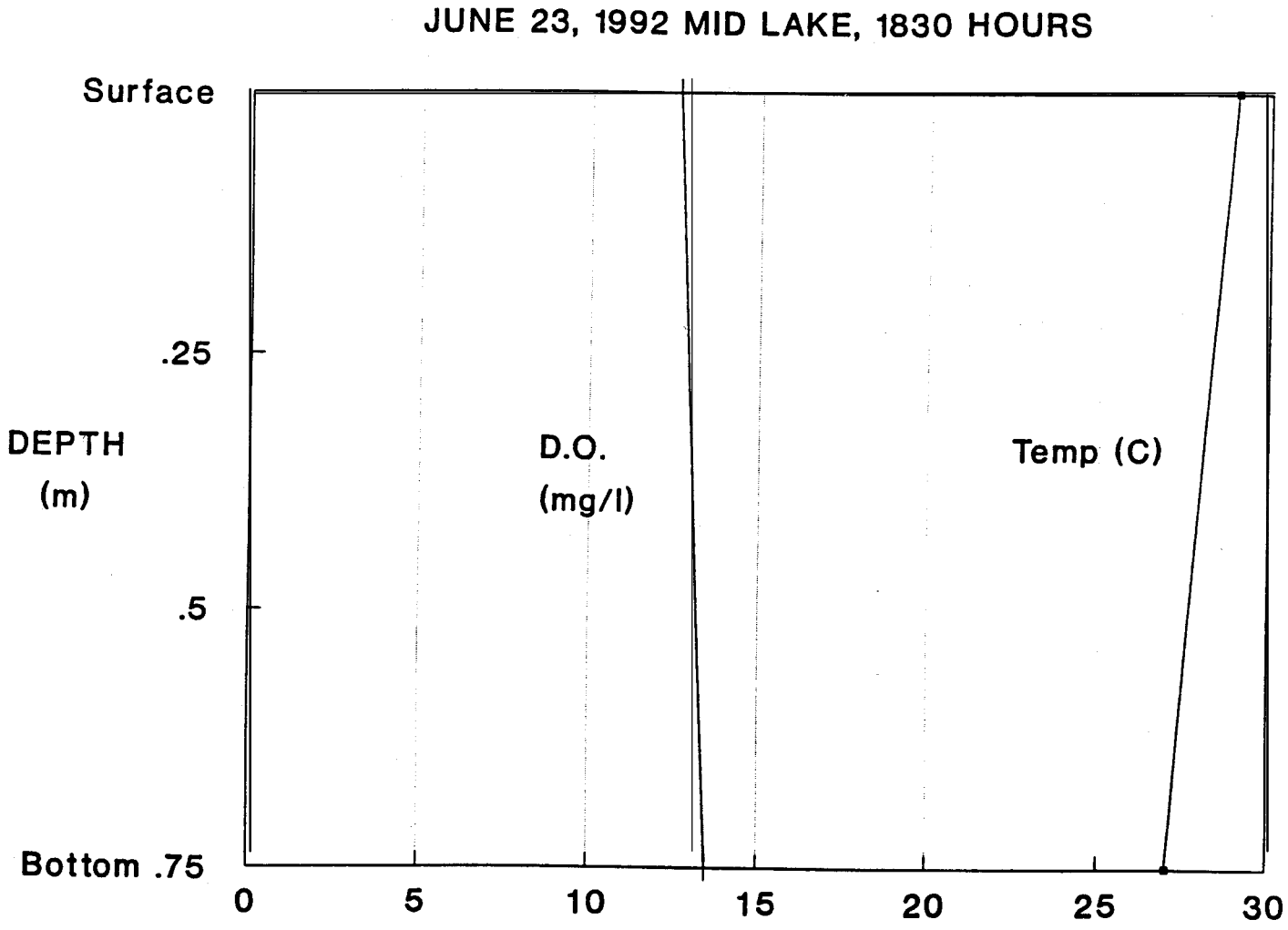
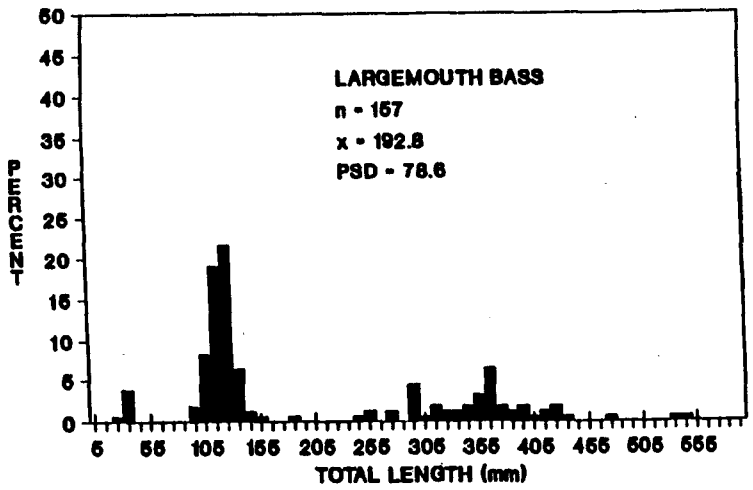
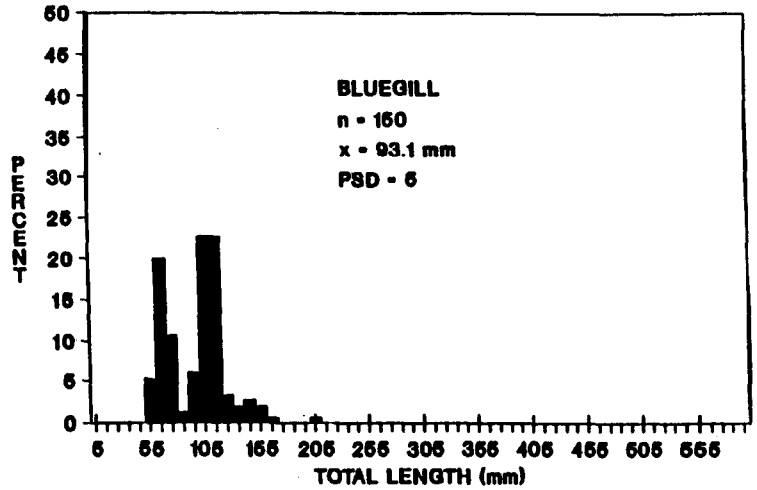
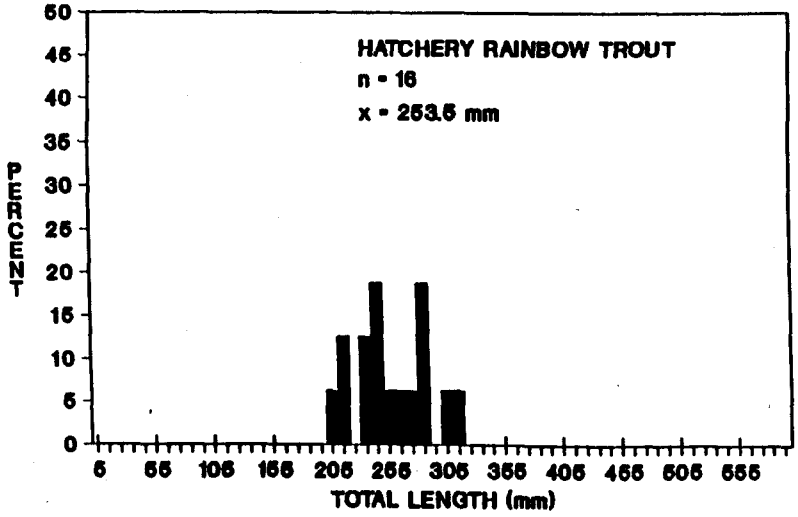


Figure 6. Temperature and dissolved oxygen profiles for Bruneau Duck Pond, June 23, 1993.







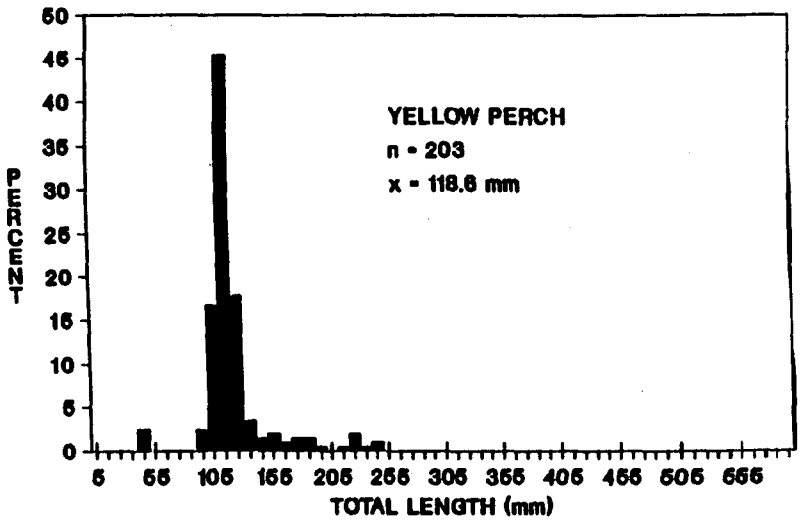


Figure 7. Length frequency distribution of largemouth bass, bluegill, hatchery rainbow trout, and yellow perch at Dog Creek Reservoir, June and July 1992.

Table 7. Length frequency of fish sampled by electrofishing in Dog Creek Reservoir in June and July 1992.

Total length (mm)	Hatchery rainbow trout	Largemouth bass	Yellow perch	Bluegill	Channel catfish	Brown bullhead
20		1				
30		6				
40			5			
50				8		
60				30		
70				16		
80				2		
90		3	5	9		
100		13	34	34		
110		30	92	34		1
120		34	36	5		2
130		10	7	3		2
140		2	3	4		1
150		1	4	3		
160			2	1		
170			3			
180		1	3			
190			1			1
200	1			1		
210	2		1			
220			4			
230	2		1			
240	3	1	2			
250	1	2				
260	1					
270	1	2				
280	3					
290		7				
300	1	1				
310	1	3				
320		2				
330		2				
340		3				
350		5				
360		10				
370		3				
380		2				
390		3				
400		1				
410		2				
420		3				
430		1				
440						
450						
460						
470		1				
480						
490						
500					1	
510						
520						
530		1				
540		1				
Total	16	157	203	150	1	7
Mean	254	197	119	93	505	134

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Table 8. Back-calculated length-at-age (mm) for largemouth bass sampled at Dog Creek Reservoir, June and July 1992. (Standard deviation in parentheses.)

Year class	Number of fish	Mean length at annulus									
		1	2	3	4	5	6	7	8	9	10
1991	9	70 (5.4)									
1990	3	82 (12.6	220 (8.6)								
1989	7	61 (11.1	161 (39.1)	260 (30.8)							
1988	6	72 (8.0)	174 (39.4)	233 (41.7)	287 (21.9)						
1987	1	80	216	241	275	295					
1983	2	74 (8.4)	161 (12.2)	226 (11.8)	262 (12.4)	305 (22.5)	349 (38.1)	378 (39.9	410 (33.8	428 (32.8	
1982	2	64 (11.9	163 (19.1)	249 (25.2)	288 (15.8)	353 (11.8)	400 (1.3)	) (5.8)	) (0.2)	) (5.3)	523 (3.3
Weighted average length		70	176	245	282	322	375	404	438	462	523

Largemouth bass PSD, using 200 mm and 300 mm as the stock and quality lengths, was 79 in 1992, compared to PSDs of 44 and 24 in 1989 (Dillon, Idaho Department of Fish and Game, personal communication) and 1990 (Partridge and Corsi 1993), respectively (Table 9). Relative stock densities (380 mm) for 1990 and 1992 were 20 and 27, respectively (Table 9). Bluegill PSDs, using 80 mm and 150 mm as the stock and quality lengths, were 8 and 5 for 1990 and 1992, respectively.

Relative weights of 23 largemouth bass between 110 mm and 380 mm varied from 102 mm to 125 mm (Table 10). PSD values greater than 80, with relative weights of quality-sized fish exceeding 110, are indicative of a population with low or no annual reproduction or low rates of mortality for a quality-sized class of fish (Anderson and Gutreuter 1980). High variation of PSDs between the three years is due to population trends, year class strengths, or sampling error. If the PSD values are reasonably accurate, then we would have to conclude that Dog Creek Reservoir is receiving little recruitment into the stock size class (100-200 mm).

Temperature and dissolved oxygen profiles were measured on June 25 at 2015 hours, and on July 16 at 0615 hours (Figure 8). There were no critically low dissolved oxygen readings on either day, although there were large quantities of algae and other aquatic macrophytes present.

Emerald Lake

On March 4, 1992, nongame fish were sampled and removed from Emerald Lake with the help of Rulon Thompson, a commercial fisherman. Rulon used a 38 mm bar mesh 121.9 m x 3.6 m seine with a bag. The seine was pulled with one boat and a truck driving along the north bank. Two hauls were made, one in approximately the center and one toward the north bank.

Approximately 5,400 kg (6 tons) of common carp and sucker Catostomus sp. were collected and shipped to a processing plant from the two hauls. Both species were healthy and in good condition. Carp and sucker were mostly of the larger size, 760 mm or larger, and up to approximately 8.2 kg. Incidental catch included some unidentified chub and about 15 rainbow trout broodstock, 2 largemouth bass, 3 channel catfish (2.3 kg to 3.6 kg) and some 250 mm to 300 mm rainbow trout. Net mesh size was large enough to allow most of the smaller rainbow trout to escape.

Little Wood Reservoir

Little Wood Reservoir water volume was reduced to 3% of its total capacity in 1992 (Harenberg et al 1993). There was no boat access available by mid-summer due to low water.

Region 4 Fisheries Management personnel assisted Fisheries Research in an intensive creel survey for a study of Little Wood Reservoir put-and-grow and put-and-take trout evaluations for the time period between June 1 and December 13, 1992. A total of 7,600 catchable-sized and 54,000 fingerling rainbow trout were stocked in the reservoir in April 1992. Fingerling rainbow trout (15,000) with adipose fin clips were stocked in September 1992. All of the catchable-sized rainbow trout were marked with a left maxillary clip. Utilizing the McArthur et al. (1992) Creel Census System, angler effort, harvest, and catch rates were projected for each 28-day time interval (Table 11). Results of this study estimated approximately 250 h/hectare of angler effort with a catch rate of 0.61

Table 9. Dog Creek Reservoir largemouth bass and bluegill PSDs in 1989, 1990, and 1992, with relative stock densities (> 380 mm) for largemouth bass in 1990 and 1992.

Year	Largemouth bass PSD	Largemouth bass RSD-15	Bluegill PSD
1989[a]	44		
1990[b]	24	20	8
1992	79	27	5

[a]Dillon, IDFG personal communication
[b]Partridge and Corsi 1993.

Table 10. Relative weights of largemouth bass in Dog Creek Reservoir on June 25, 1992.

Size Class (mm)	Number	Relative weight
100-119	1	125
120-139	3	102
140-159	0	-
160-179	0	-
180-199	0	-
200-219	0	-
220-239	0	-
240-259	1	111
260-279	1	123
280-299	6	124
300-319	1	109
320-339	1	118
340-359	6	104
360-379	2	112
380-399	1	121
Total	23	
Mean		115

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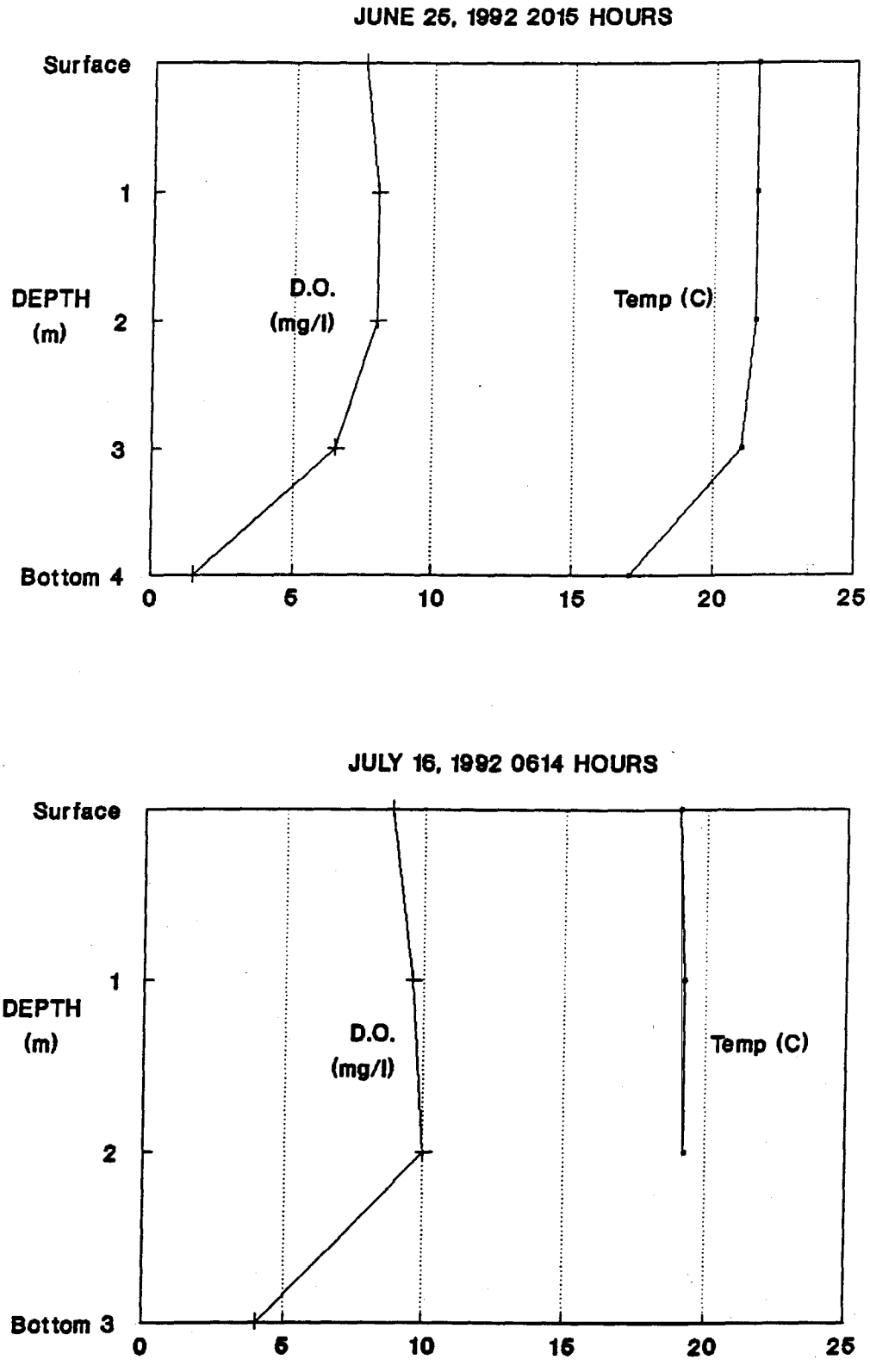

Figure 8. Temperature and dissolved oxygen profile for 8:00 PM of June 25, 1992 and 6:15 AM of July 16, 1992 at Dog Creek Reservoir.

Table 11. Little Wood Reservoir summary of estimated angler effort, catch rates, and harvest by 28-day intervals between June 1 and December 13, 1992.

Interval	Angler effort (Hours)	Fish caught	Trout harvest				
			Total	Hatchery Rainbow[a]	Hatchery Rainbow[b]	Wild Rainbow[c]	Cutthroat[d]
June 1 - June 28	7,038	3,658	3,553	983	1,204	1,364	0
+/- at 95% C.I.	2,059	1,462	1,455	474	903	687	0
Fish caught per hour		0.5	0.5	0.1	0.2	0.2	0.0
June 29 - July 26	3,030	608	578	456	92	15	15
+/- at 95% C.I.	1,116	386	378	318	107	33	30
Fish caught per hour		0.2	0.2	0.2	<0.1	<0.1	<0.1
July 27 - Aug 23	1,207	514	442	232	0	210	0
+/- at 95% C.I.	789	524	440	310	0	320	0
Fish caught per hour		0.4	0.4	0.2	0.0	0.2	0.0
Aug 24 - Sep 20	828	108	108	15	77	15	0
+/- at 95% C.I.	465	163	163	40	135	32	0
Fish caught per hour		0.1	0.1	<0.1	0.1	<0.1	0.0
Sep 21 - Oct 18	1,543	2,155	1,796	657	588	552	0
+/- at 95% C.I.	900	1,291	1,197	570	443	665	0
Fish caught per hour		1.4	1.16	0.4	0.4	0.4	0.0
Oct 19 - Nov 15	874	879	879	181	286	434	0
+/- at 95% C.I.	695	968	968	215	338	511	0
Fish caught per hour		1.0	1.0	0.2	0.3	0.5	0.0
Nov 16 - Dec 13	429	1,226	511	51	153	306	0
+/- at 95% C.I.	95	347	357	84	253	76	0
Fish caught per hour		2.9	1.2	0.1	0.4	0.7	0.0
Total	14,949	9,148	7,867	2,575	2,400	2,896	15
+/- at 95% C.I.	2,761	2,305	2,231	895	1,104	1,134	30

[a]Identified by lack of marks except fin erosion as hatchery rainbow trout.
[b]Identified by left maxillary clip as hatchery rainbow trout stocked as catchable sized fish in spring of 1992.
[c]Rainbow trout identified by lack of marks and fin erosion as either of wild origin or stocked as fingerling.
[d]Cutthroat trout are stocked in alpine lakes in the drainage.

fish/h. Hatchery trout stocked as catchables had a harvest rate of 0.16 fish/h for a 31.5% return-to-the-creel for the entire period. Cutthroat trout O. clarki originating from alpine lake stockings were also caught. This study will continue through 1994 with evaluations of spring and fall fingerling and catchable releases.

Temperature and dissolved oxygen profiles were measured in the reservoir near the Little Wood River inlet, mid-reservoir, and near the dam on July 4, 1992 (Figure 9).

Magic Reservoir

Water at Magic Reservoir was drained to minimum levels earlier in 1992 than in any previous year. Total reservoir volume dropped to less than 1% of its total capacity by August 31 (Harenberg et al. 1993). Dead storage volume was sufficient to support fish at minimum pool. Reservoir levels dropped continuously throughout the early part of summer, then fluctuated throughout the latter half of the summer and early fall, as releases from the dam fluctuated. There was no developed boat ramp access during periods of extreme low water.

Region 4 Fisheries Management personnel assisted Fisheries Research in a study of Magic Reservoir for put-and-grow and put-and-take trout evaluations for the time period between June 1 and December 13, 1992. In April 1992, 33,850 catchable-sized rainbow trout and 201,400 fingerling were stocked into the reservoir. All catchable-sized trout were marked with a left maxillary clip. In the fall of 1991, 50,102 fingerling rainbow trout with adipose fin clips were stocked into the reservoir, which showed up in the creel in 1992. Fisheries Management was primarily involved in the creel surveys of this study. Utilizing the McArthur et al. (1992) Creel Census System computerized creel survey assessment program, angler effort, harvest, and catch rates were projected for each time interval (Table 12). Angler effort for the period from June 1 through November 15 was approximately 300 h/hectare with a catch rate of 0.46 fish/h. There was a 27.6% return-to-the-creel of marked catchables. Comparisons of different fish release strategies will continue through 1993.

Fish sampling was done with two sinking and two floating gill nets set overnight at sites near the dam and near the Big Wood River inlet within the reservoir on April 21, 1992. Fish sampled included 15 hatchery rainbow trout, 7 rainbow trout of unidentifiable origin, 1 brown trout Salmo trutta, and 15 largescale suckers (Table 13).

On November 19, 1992, a redd count was made for spawning brown trout which move upstream into the Big Wood River from Magic Reservoir. The reach surveyed includes the area of Rock Creek from its mouth to Highway 20 and between the mouth of Rock Creek upstream to Davis Pond, approximately 0.8 km upstream of the Highway 20 bridge at Stanton Crossing. The total redds counted was 43 in 1992, which is down from total redds counted in previous years since 1986 (Table 14).

Temperature and dissolved oxygen profiles were measured in the reservoir on April 21, July 3, and August 31, 1992 (Figure 10). On April 21, it was measured near the Big Wood River inlet and near the dam. On July 3, it was measured near the Big Wood River inlet, mid-reservoir between the west side community and Myrtle Point boat ramp, and near the dam. On August 31, it was measured near the dam.

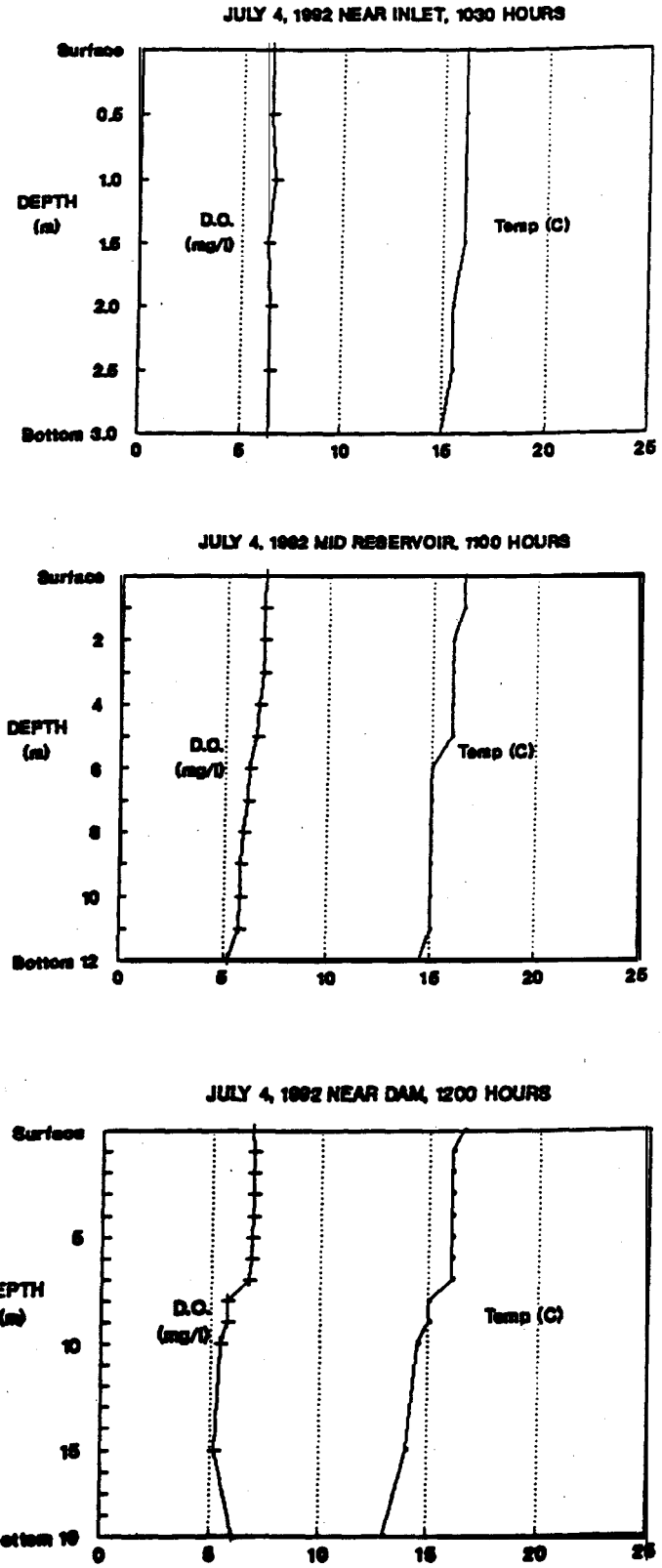

Figure 9. Temperature and dissolved oxygen profiles for three sites on July 4, 1992 at Little Wood Reservoir.

Table 12. Magic Reservoir summary of estimated angler effort, catch rates, and harvest by 28-day intervals between June 1, 1992 and December 13, 1992.

Interval	Angler effort (Hours)	Fish caught	Trout harvest						
			Total	Hatchery Rainbow[a]	Hatchery rainbow[b]	Hatchery Rainbow[c]	Wild rainbow[d]	Brown trout	Yellow perch
June 1 - June 28	17,450	4,121	2,984	1,967	995	0	0	0	24
+/- at 95% C.I.	2,274	1,52	1,433	1,284	488	0	0	0	50
Fish/hour		0.2	0.2	0.1	0.1	0	0	0	<0.1
June 29 - July 26	19,630	8,904	6,549	2,582	3,532	48	290	0	97
+/- at 95% C.I.	5,461	4,038	2,469	1,455	1,515	110	312	0	192
Fish/hour		0.5	0.3	0.1	0.2	<0.1	<0.1	0	<0.1
July 27 - Aug 23	8,538	5,144	3,741	2,108	1,424	0	166	0	47
+/- at 95% C.I.	3,017	3,614	2,225	2,061	1,255	0	206	0	108
Fish/hour		0.6	0.4	0.2	0.2	0	<0.1	0	<0.1
Aug 24 - Sep 20	7,775	6,857	4,891	2,592	2,064	0	158	77	0
+/- at 95% C.I.	3,068	4,869	2,284	1,682	1,215	0	249	160	0
Fish/hour		0.9	0.6	0.3	0.3	0	<0.1	<0.1	0
Sep 21 - Oct 18	5,858	2,391	2,223	1,357	806	0	25	13	21
+/- at 95% C.I.	1,979	1,133	1,116	703	514	0	40	27	38
Fish/hour		0.4	0.3	0.2	0.1	0	<0.1	<0.1	<0.1
Oct 18 - Nov 15	1,465	507	507	126	330	0	51	0	0
+/- at 95% C.I.	1,031	468	468	149	361	0	70	0	0
Fish/hour		0.3	0.3	0.1	0.2	0	<0.1	0	0
Nov 16 - Dec 13[e]	0		0	0	0	0	0	0	0
Total	60,716	27,924	20,895	10,732	9,151	48	690	90	189
+/- at 95% C.I.	7,648	7,616	4,448	3,371	2,445	110	457	162	229

[a]Identified by lack of marks except fin erosion as hatchery rainbow trout.
[b]Identified by left maxillary clip as hatchery rainbow trout stocked as catchable sized fish in spring of 1992.
[c]Identified by adipose clip as hatchery rainbow trout stocked as fingerlings in September 1991.
[d]Rainbow trout identified by lack of marks and fin erosion as either of wild origin or stocked as fingerlings.
[e]No anglers were observed during this period (due to inclement weather).

Table 13. Length frequency of fish sampled by gill nets in Magic Reservoir on April 22, 1992.

Total length (mm)	Hatchery rainbow trout	Wild rainbow trout[a]	Brown trout	Largescale sucker
100				
110				
120				
130				
140				1
150				
160				1
170				
180				
190				
200				
210				
220				
230				1
240				1
250				1
260				1
270				4
280	1			
290				1
300				3
310				
320				
330				1
340				
350	1			
360		3		
370	3			
380	3			
390				
400	2			
410		1		
420	2	1		
430	1			
440	1	1		
450		1		
460				
470/	1			
700			1	
Total	15	7	1	15
Mean	393	403	700	260

[a]Includes both wild and hatchery fingerling trout with good fins.

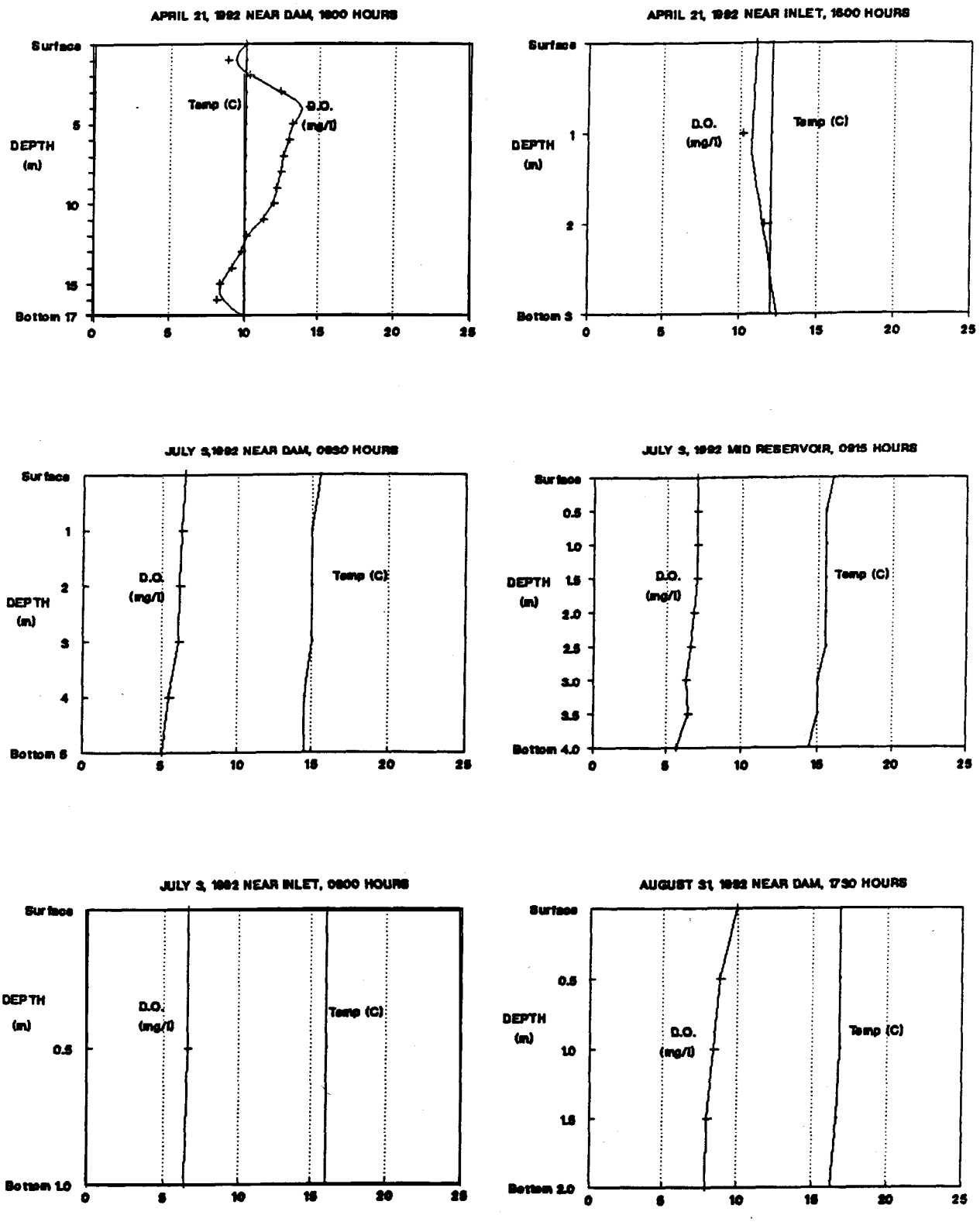

Figure 10. Temperature and dissolved oxygen profiles for two sites on April 21, three sites on July 3, and one site on August 31, 1992 at Magic Reservoir.

Oakley Reservoir

Six continuous years of drought caused Oakley Reservoir to drop to minimum pool levels by late summer of 1992. The reservoir is managed as a mixed cold and warmwater fishery, with walleye Stizostedion vitreum and rainbow trout the only game fish species sampled in gill nets in 1991 (Partridge and Corsi 1993). On October 25, 1992, six shoreline beach seine samples were taken to continue monitoring the status of the spottail shiner Notropis hudsonius population which was introduced into the reservoir in 1989 (Partridge and Corsi 1990). Seine hauls were taken on the west side of the reservoir from the inlet of Trapper Creek to the dam, which approximated the six sites sampled in previous years. Species sampled included 26 spottail shiner, 13 sculpin Cottus sp. and 2 yellow perch (Table 15). Total number of fish and number of species sampled was down from similar beach seining samples taken in previous years since 1989 (Table 16). Species sampled in previous years, but not in the 1992 sample, include redside shiner Richardsonius balteatus, sucker sp., dace sp., chub sp., and hatchery rainbow trout.

Roseworth (Cedar Creek) Reservoir

During late summer of 1992, Region 4 Fishery Management personnel received a complaint of nongame fish species catch rates becoming a nuisance to the sport fishermen on Roseworth Reservoir. Core population data was thus collected for Roseworth Reservoir in October. One unit of effort for lowland lakes fishery surveys was expended (IDFG 1992). Total surface area for the reservoir at the time of sampling was estimated to be approximately 25 hectares, which fluctuated significantly due to the large open shallow water area and the fluctuating release schedule for downstream water uses. Limnological data collected included dissolved oxygen and temperature profiles (Figure 11), alkalinity, and specific conductance. Alkalinity measured 27 mg/l as $CaCO_3$ and specific conductance measured 80 μmhos/cm^2 on water samples taken on October 7, 1992.

The fishery survey resulted in sampling a total of 441 (44%) Utah chub Gila atraria, 223 (22%) bridgelip sucker Catostomus columbianus, 316 (32%) redside shiner, and 17 (2%) rainbow trout (Table 17). Electrofishing sampled 41 Utah chub, 56 bridgelip sucker, 196 redside shiner, and 6 rainbow trout. Trap nets sampled 3 Utah chub, 47 bridgelip sucker, 120 redside shiner, and no rainbow trout. One sinking and one floating gill net sampled 397 Utah chub, 120 bridgelip sucker, no redside shiner, and 11 rainbow trout. Back-calculated length-at-age was determined for wild or hatchery rainbow trout planted as fingerling (Table 18). With these fish sampling results, and due to the fact the drought had reduced the total water volume to less than 5% of its total capacity, Region 4 Fishery Management personnel treated the reservoir with Rotenone during the fall, prior to freeze up, using methods described by Horton (1991). A memorandum describing the treatment process was written and sent to the Fisheries Bureau (Appendix A). A total of 445 gal of 2.5% synergized Rotenone, for an estimated concentration of 3.5 ppm to 4.0 ppm, was used to treat on November 18. During spring of 1993, the reservoir was tested for residual toxicity and sampled with gill nets to determine the effectiveness of the treatment, then restocked with fingerling and catchable rainbow trout.

Table 14. Brown trout redd counts on Big Wood River and Rock Creek above Magic Reservoir.

Date	Big Wood River[a] Area 1	Area 2	Area 3	Area 4	Total	Rock Creek
Nov 19, 1986		26	-[b]	96	122	--
Nov 19, 1987	104	62[c]	-[b]	30	196	--
Nov 15, 1988	13	75	31	39	158	--
Nov 18, 1989	6	20	33	8	67	1
Nov 20, 1990	1	25	30	14	70	0
Nov 15, 1991	3	30	38	15	86	0
Nov 19, 1992	5	14	9	15	43	0

[a]Area 1 - Rock Creek to Sheep Bridge.
Area 2 - Sheep Bridge to fence at USGS gauge.
Area 3 - Fence to Stanton Crossing.
Area 4 - Stanton Crossing to Davis Pond.
Rock Creek - Highway 20 to mouth.
[b]Combined with previous reach.
[c]A total of 42 female brown trout were trapped from this section and spawned at Hayspur Hatchery.

Table 15. Length frequency of fish sampled by beach seine in Oakley Reservoir on October 23, 1992.

Total length (mm)	Spottail shiner	Sculpin sp.	Yellow Perch
30	9		
40	5	9	
50		4	1
60	1		
70			
80	10		1
90	1		
Total	26	13	2
Mean	56	45	70

Table 16. Fish sampling results from beach *seining* at Oakley Reservoir, 1989-1992.

	Year			
	1989	1990	1991	1992
	6 seines	3 seines	6 seines	6 seines
	Percent of sample			
Yellow perch	<1	6	17	5
Spottail shiner	26	52	42	63
Redside shiner	22	2	0	0
Sucker sp.	38	28	8	0
Sculpin sp.	14	11	8	32
Dace sp.	<1	<1	8	0
Chub sp.	0	<1	0	0
Hatchery rainbow trout	0	1	17	0
Total no. fish sampled	147	269	24	41

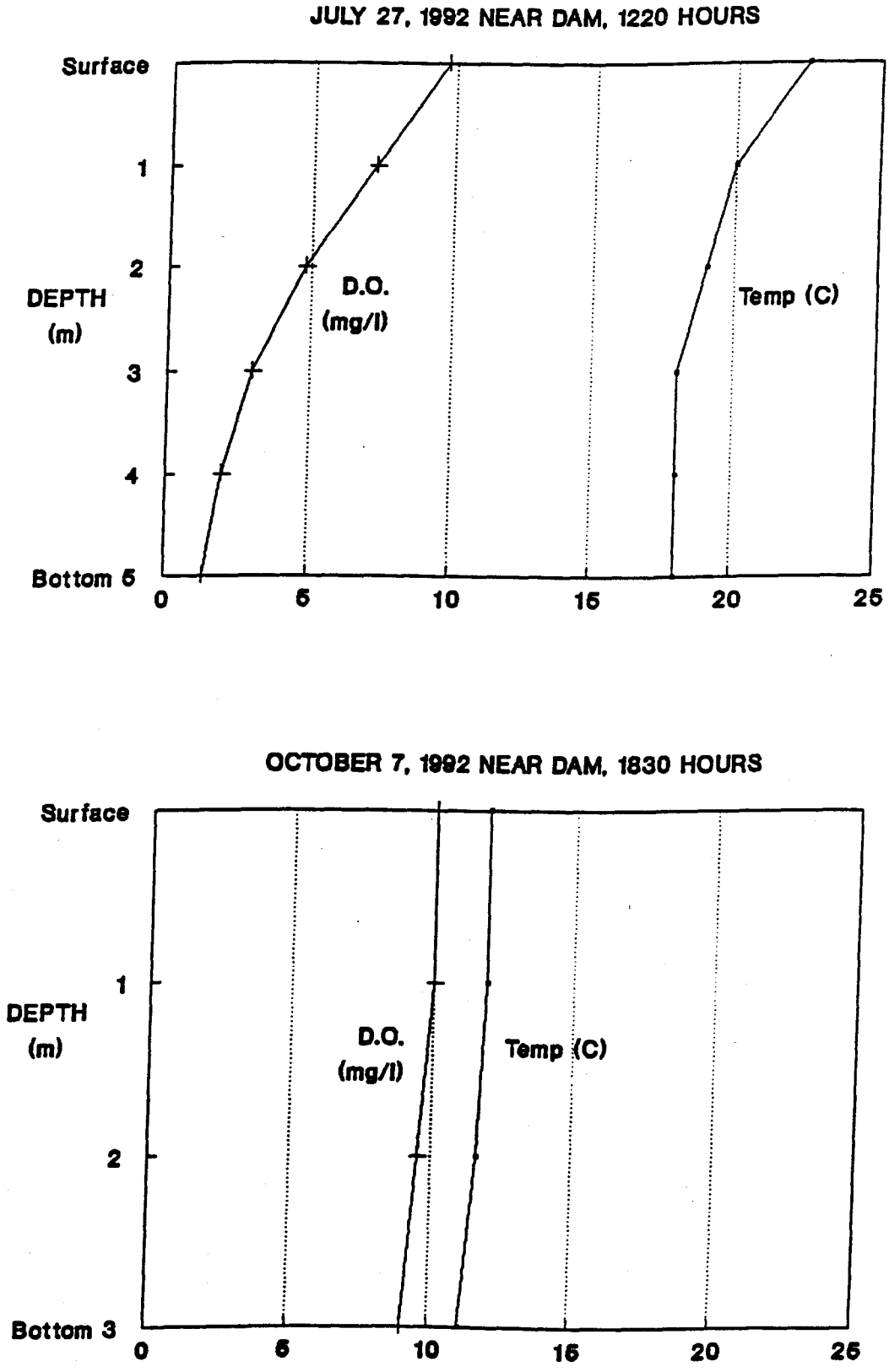

Figure 11. Temperature and dissolved oxygen profiles for July 27 and October 7, 1992 at Roseworth Reservoir.

Table 17. Length frequency of fish sampled[a] in Roseworth Reservoir in October 1992.

Total length (mm)	Hatchery rainbow trout	Fingerling plant rainbow trout	Bridgelip sucker	Redside shiner	Utah chub
50				1	
60				1	
70				3	
80				16	
90				20	
100				7	
110				1	
120					
130					
140					5
150					40
160			2		40
170			9		11
180			11		6
190			8		14
200			5		14
210			7		10
220			9		7
230			7		4
240			5		2
250			3		
260			1		1
270		1	1		2
280	4	2	1		1
290		1	1		1
300	1		4		2
310			5		1
320			1		1
330			3		
340			8		
350			2		
360			1		
370					
380	1		1		
390	1	4			
400					
410					
420					
430					
440		1			
450					
Total	7	10	95	49	162
Mean	314	346	240	87	182
Not Measured	0	0	128	267	279

[a]1 hour electrofishing, 1 set of gill nets, 1 trap net.

Table 18. Back-calculated length-at-age (mm) for wild or hatchery rainbow trout planted as fingerlings sampled at Roseworth Reservoir, October 1992. (Standard deviation in parentheses.)

Year class	Number of fish	Mean length at annulus 1	2	3	4
1990	1	135 -	177 -		
1990	1	135			
1989	5	132 (24.5)	188 (36.8)	250 (45.4)	
1988	3	99 (7.6)	166 (11.4)	261 (51.8)	327 (29.3)
Weighted average length		136	179	254	327

Salmon Falls Creek Reservoir

Usable irrigation water was removed from Salmon Falls Creek Reservoir by mid-July 1992, leaving 190 cubic hectometers (154,200 acre-feet) of water in dead storage. Despite severely low water conditions, the boat ramp near the dam remained usable.

Temperature and dissolved oxygen profiles were measured near the dam, at Greys Landing, and mid-reservoir near Whiskey Slough on July 27, 1992 (Figure 12). Water temperatures from the surface to 10 m ranged from 22°C to 18°C. Below 10 m, dissolved oxygen levels ranged from 6 mg/l to approximately 2.5 mg/1 (Figure 13).

On October 20, 1992, six beach seine hauls were made to monitor young-of-year (YOY) forage and spottail shiner availability, which were initially introduced in 1987. Seining sites were scattered throughout the reservoir from the dam to the Salmon Falls Creek inlet (Figure 12). Species sampled include 23 black crappie, 2 hatchery rainbow trout, 36 yellow perch, 48 mature kokanee salmon, 15 spottail shiner, and 4 largescale sucker (Table 19). Only 32 of the mature kokanee were measured (Figure 14). Total number of fish sampled was less than the number sampled in 1991, but more than the number sampled in 1990 (Table 20). In 1990, one seine haul sample was taken near the boat ramp at the dam, and in 1991, four seine haul samples were taken including areas near the boat ramp at the dam, Whiskey Slough, Lucas Point, and Greys Landing. Due to highly fluctuating water levels from year to year, it is difficult to make direct comparisons of previous years' seining results for each site.

On the evening of July 29, 1992, four mid-water transects were trawled in the reservoir to determine kokanee densities. Trawling methods used were described by Rieman (1992). Trawling depths per transect varied with water column depth. Near the inlet, depths from near surface to 7.5 m were trawled, while near the dam depths from near surface to 15 m were trawled. Each transect was trawled for a total of 6 min to 12 min, depending on number of steps (depths) trawled. A total of 19 kokanee, ranging
from 150 mm to 380 mm were sampled (Table 21). The number of fish sampled was too small to make total population or density estimates.

Sublett Reservoir

Sublett Reservoir is a 32-hectare irrigation impoundment (Sec 03, T13S, R29E) on a tributary of the Raft River. In July and August 1992, the reservoir was drawn down to less than 2 m and less than 12 hectares in surface area. The remaining water became choked with aquatic vegetation. Numerous fish were lost downstream from the reservoir through the outlet during water releases for irrigation uses. When this water was first shut off on July 22, numerous fish were left stranded in shallow pools or on the dry stream bed. Region 4 Fishery Management personnel salvaged and returned to the reservoir approximately 433 rainbow trout averaging 220 mm, 50 brown trout averaging 120 mm, and 17 cutthroat trout averaging 200 mm. There were approximately 150 mortalities left in the dry stream bed. Scale samples were taken from 16 of the wild rainbow trout mortalities (Table 22). Water from the reservoir was released and shut off again on August 6, 1992, but less than 50 fish were salvaged and returned to the reservoir.

Dissolved oxygen and temperature profiles were measured near the dam and mid-reservoir early afternoon on August 4 (Figure 15).

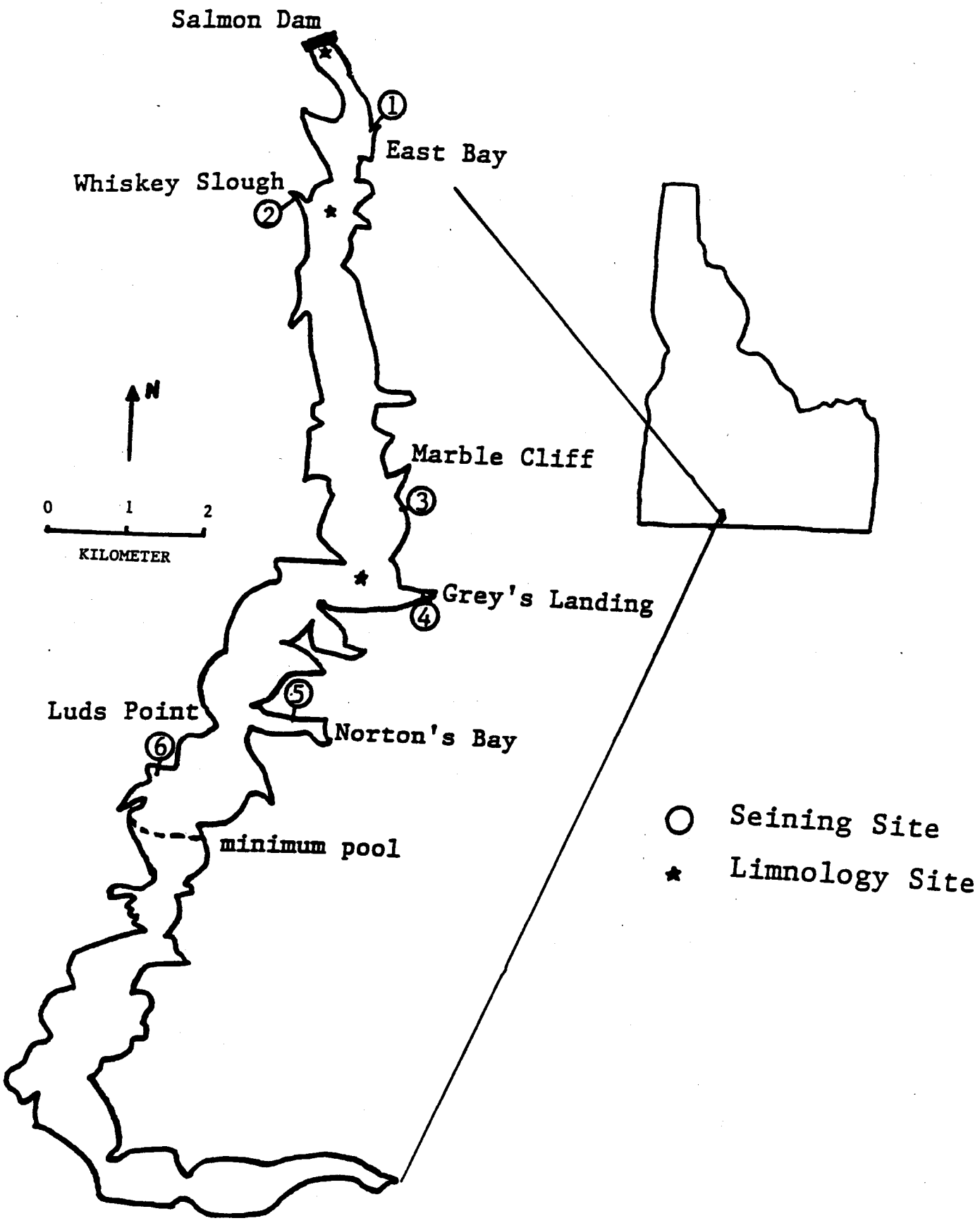

Figure 12. Salmon Falls Creek Reservoir sampling sites and mouth of Salmon Falls Creek at minimum pool.

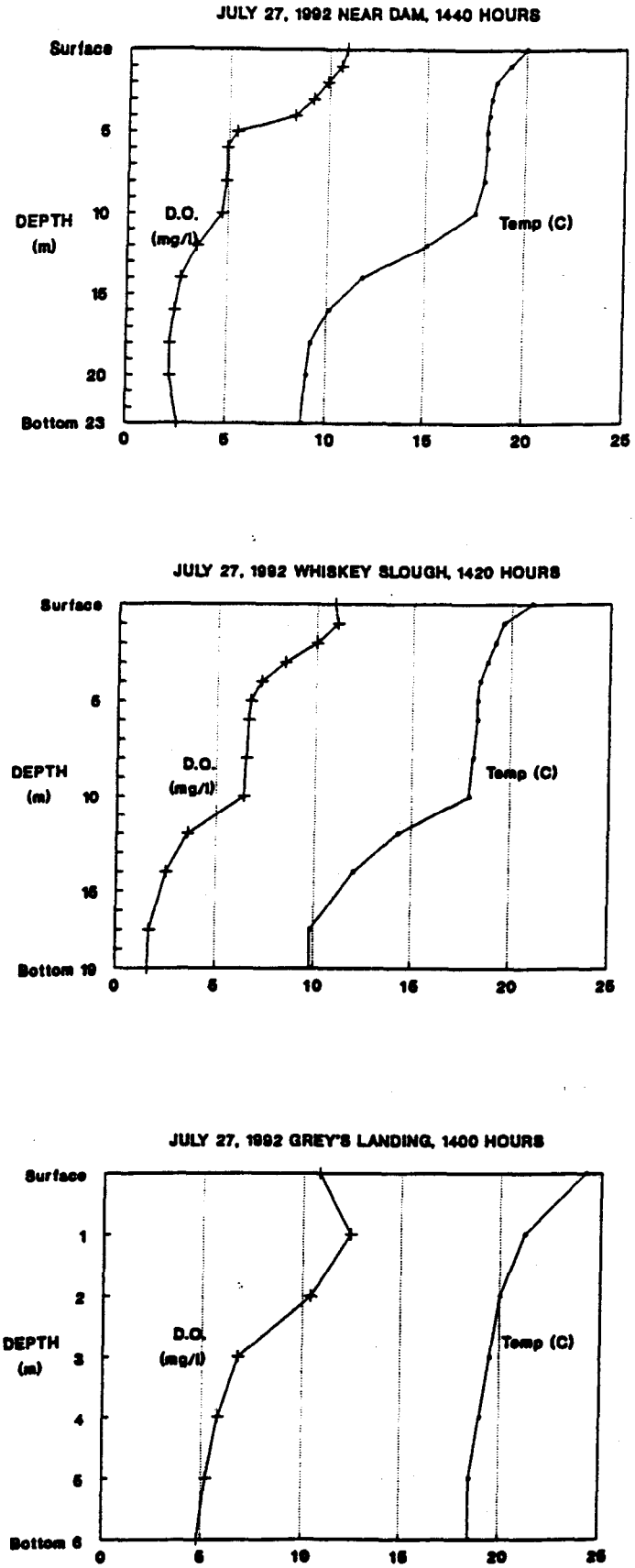

Figure 13. Temperature and dissolved oxygen profiles for three sites on July 27, 1992 at Salmon Falls Creek Reservoir.

Table 19. Length frequency of fish sampled by beach seine in Salmon Falls Creek Reservoir on October 20, 1992.

Total length (mm)	Black crappie	Hatchery rainbow trout	Yellow perch	Kokanee' female	Kokanee' male	Spottail shiner	Largescale sucker
30						10	
40	4					3	
50	17		3			2	2
60	2		20				1
70			11				1
80							
90			1				
100							
110			1				
120							
130							
140							
150							
160							
170							
180							
190							
200							
210							
220							
230							
240		1					
250							
260							
270							
280							
290							
300					1		
310					3		
320				1			
330							
340				2			
350				1			
360				2			
370		1		3	1		
380				3			
390					5		
400				1	3		
410				1	3		
420							
430							
440							
450							
Total	23	2	36	14	18	15	4
Mean	52	308	67	368	378	37	61

subsample of 32 kokanee were measured out of a total sample of 48.

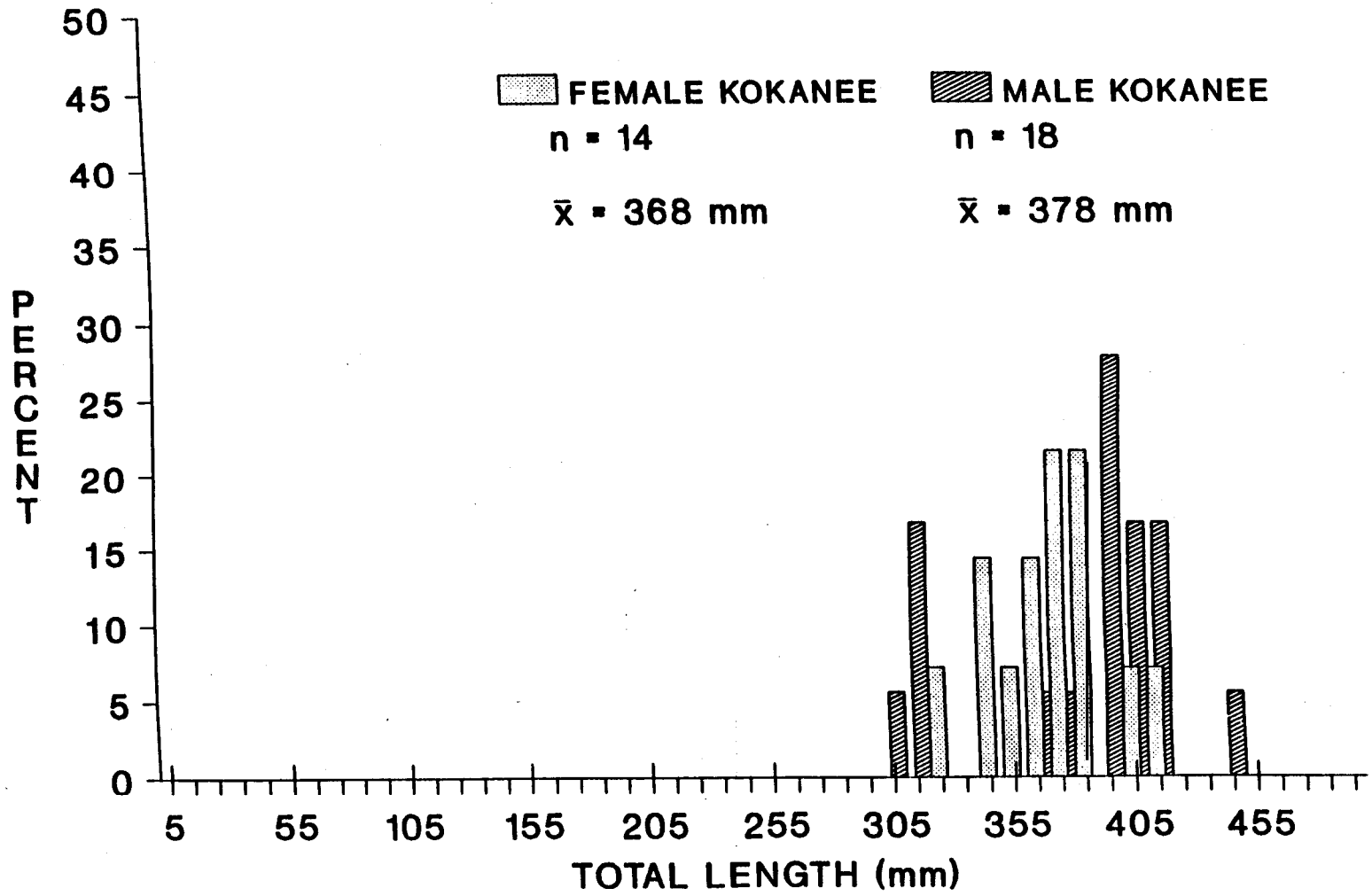

Figure 14. Length frequency distribution of subsample of adult kokanee seined at Salmon Falls Creek Reservoir on October 20, 1992.

Table 20. Fish sampled by beach seining at Salmon Falls Creek Reservoir, 1990-1992.

	Year					
	1990		1991		1992	
	1 seine		4 seines		6 seines	
Species	Number	Percent	Number	Percent	Number	Percent
Black crappie	28	58	500	5	23	18
Smallmouth bass	1	2	0	0	0	0
Yellow perch	0	0	10,000	95	36	28
Walleye	0	0	1	<1	0	0
Spottail shiner	19	40	15	<1	15	12
Redside shiner	0	0	1	<1	0	0
Sucker Sp.	0	0	3	<1	4	3
Hatchery rainbow trout	0	0	0	0	2	1
Kokanee	0	0	0	0	48	38
Total no. fish sampled	48		10,520		128	

Table 21. Length frequency of kokanee sampled by nighttime trawl on July 29, 1992 at Salmon Falls Creek Reservoir.

Total length (mm)	Kokanee
150	3
160	4
170	
180	
190	
200	1
210	1
220	1
230	3
240	
250	
260	
270	
280	
290	
300	
310	
320	
330	1
340	2
350	
360	
370	2
380	1
390	
400	
Total	19
Mean	240

Table 22. Back-calculated length-at-age (mm) for wild rainbow tro **t** at Sublett Reservoir, Julv 1992. (Standard deviation parentheses.)

Year class	Number of fish	Mean lenath at annulus 1	2	3
1991	4	132 (55.9)		
1990	10	109 (36.1)	180 (69.7)	
1989	2	108 (24.5)	174 (24.4)	230 (10.5)
Weighted average length		115	179	230

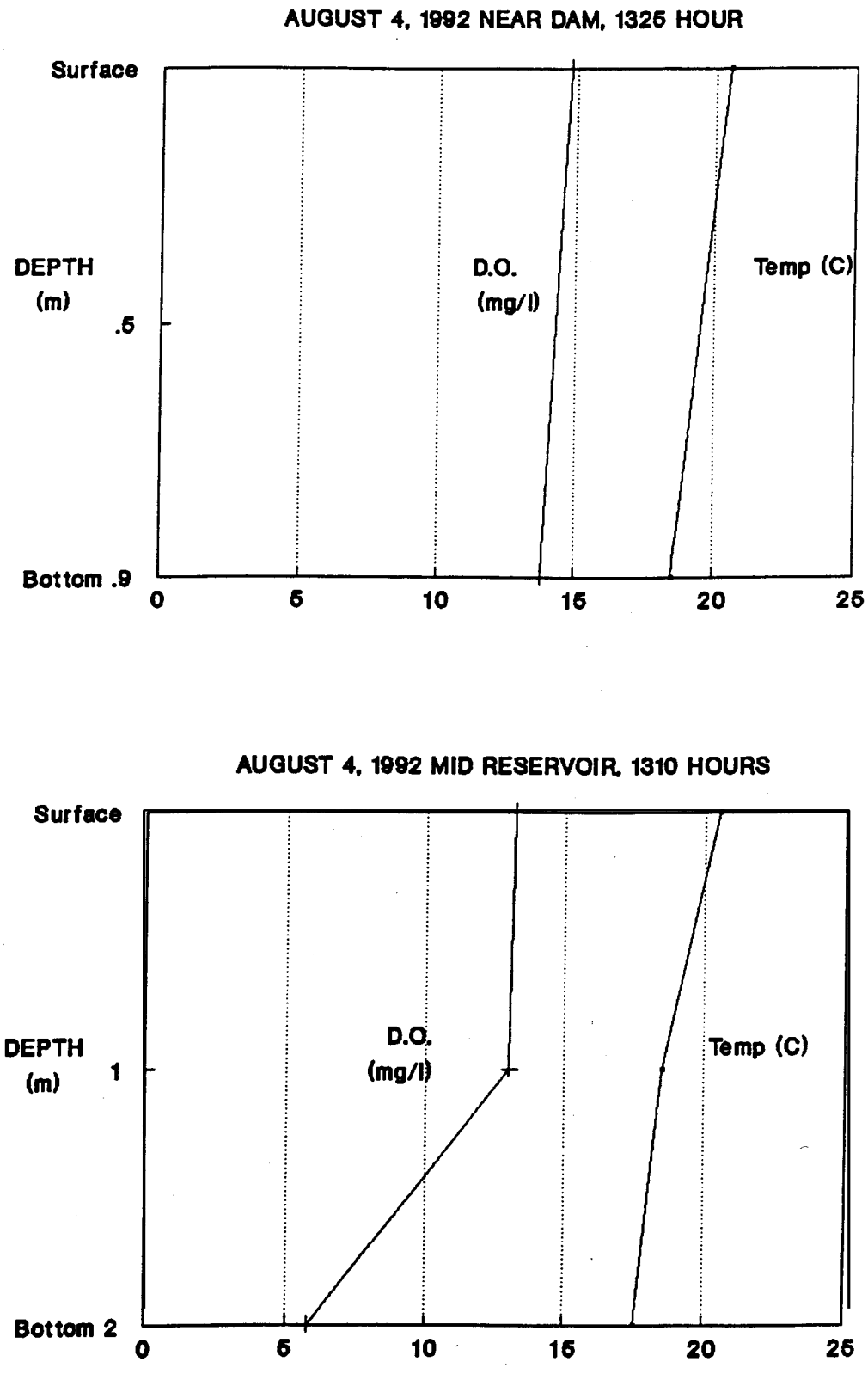

Figure 15. Temperature and dissolved oxygen profiles for two sites on August 4, 1992 at Sublett Reservoir.

Stone (Curlew} Reservoir

Stone Reservoir is an irrigation storage impoundment located on Deep Creek in Oneida County, Idaho (Sec 35, T15S, R32E). Deep Creek is a tributary to Salt Lake in the Great Basin. The reservoir is 11 km north of Snowville, Utah at an elevation of 1,400 m. The reservoir is owned by the Delmore Canal Company and provides irrigation water to lands in Idaho and Utah. When full, the reservoir has a surface area of 123 hectares and a volume of 8.1 cubic hectometers (6,594 acre-feet) (Idaho Department of Water Resources 1981). Dam height is 10.4 m. Drainage area above the reservoir is 655 square km.

Water levels were drawn down a maximum of 3 m in front of the dam in 1992. Dissolved oxygen and water temperature profiles were measured to discern the impacts low water conditions may be having on water quality. Measurements were taken in front of the dam at 1545 hours on August 4, 1992. Dissolved oxygen ranged from 10.6 mg/l at the surface to 7.8 mg/1 at the bottom, and the temperature ranged from 23°C at the surface to 21°C at the bottom (Figure 16).

Stone Reservoir is managed as a mixed cold and warmwater fishery. Results of the water temperature profile indicate it is unlikely cold water species could have survived the high temperatures induced by the low water levels of 1992. It is possible that during normal water years the reservoir would remain deep enough to provide a "comfort zone" in the hypolimnion for cold-water species.

Regional Creel Surveys

A region-wide creel survey was made on the opening day of the general fishing season (Table 23). There were 24 waters surveyed with a total of 494 angler contacts made for a total of 1,032 h fished. Overall catch rate was 0.7 fish/h. Of special interest was the appearance of a northern pike Esox lucius in the harvest in the Riley impoundment on the Hagerman Wildlife Management Area.

Spot creel checks made in 1992, excluding *opening* day, were made and recorded for 11 waters (Table 24). Catch rates ranged from 0.1 fish/h at Roseworth Reservoir to 8.0 fish/h at Big Smokey Creek.

There were a total of 13 fishing tournaments in six different waters in Region 4 in 1992 (Table 25). Catch rates averaged 0.1 fish/h for smallmouth bass Micropterus dolomieu and 0.1 fish/h for largemouth bass. Other species entered in tournaments included rainbow trout, walleye, and kokanee at Salmon Falls Creek Reservoir, a fly fishing catch-and-release tournament for rainbow trout on the Big Wood River, and a kids' tournament for rainbow trout stocked in the Perrine Coulee.

Catchable Trout Evaluations

Standard reward jaw tags were placed on samples of catchable-sized rainbow trout stocked into a variety of Region 4 waters in 1990, 1991, and 1992. Each tag is independently numbered so it may be traced back to the water and date the fish was stocked. Anglers received a "TROUT" ball cap for every tag returned to the Department.

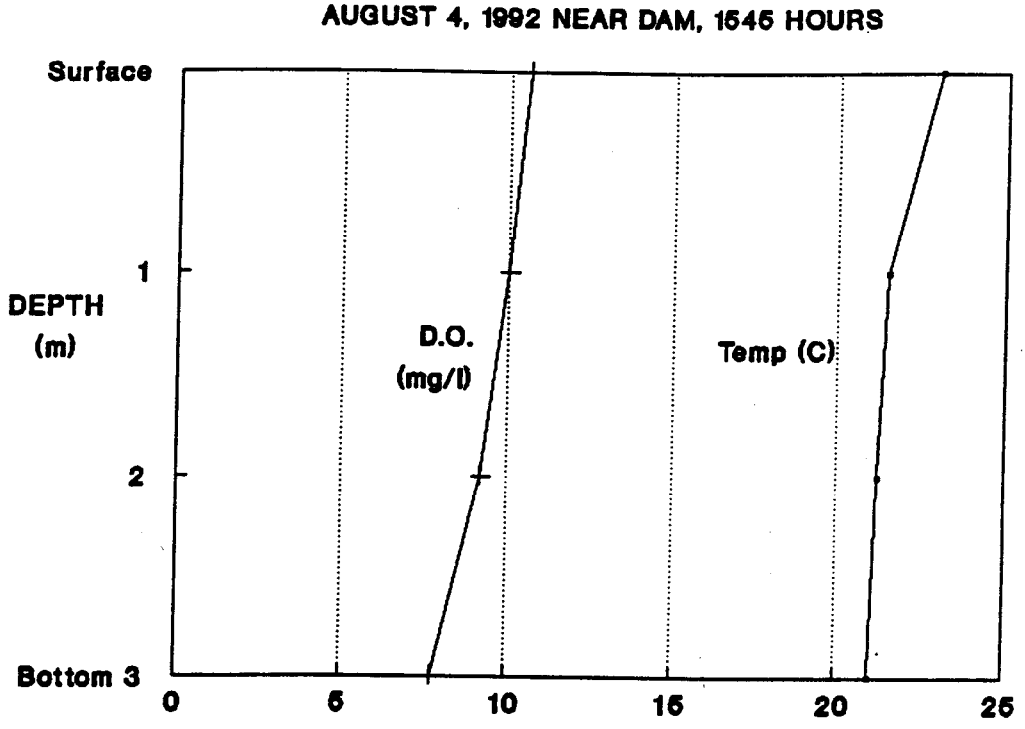

Figure 16. Temperature and dissolved oxygen profiles for Stone Reservoir on August 4, 1992.

Table 23. Results of creel checks performed at Region 4 waters on opening day (May 23) of the general fishing season, 1992.

Location	Anglers	Hours fished	Fish[a] Caught													
			HRB	WRB	CTT	BRN	EB	CHS	KOK	LMB	SMB	BG	MWF	BT	YP	NP
Anderson Ranch Reservoir	41	88	10	3				1	8		3					
Big Wood River	18	17.5	9	3			1									
Billingsley Creek	2	2	1													
Dog Creek Reservoir	8	18	5													
Goose Creek	4	2														
Hagerman WMA[b]	55	18	44							73		224			8	1
Jarbidge River	0															
Little Smoky Creek	45	71	11	2									3	1		
Little Wood Reservoir	49	50.5	46	25												
Little Wood River	0															
Magic Reservoir	56	15	51													
Malad River	21	25.5	34	2												
Roseworth Reservoir	9	14.5														
Silver Creek	12	56		56		4										
S. Fk Boise River	46	71	14	2										1		
Stone Reservoir	3	8.5	5													
Sublett Creek	3	7				2										
Sublett Reservoir	39	97		21	4	7										
Thorn Creek Reservoir	7	18	26													
Trapper Creek	21	19	14	1			1									
Warm Springs Creek	23	31.5	20	1												
Lake Walcott	32	95	a													

[a]HRB = Hatchery rainbow trout, WRB = Wild rainbow trout (including hatchery fingerlings), CTT = Cutthroat trout, BRN = Brown trout, EB = Brook trout, CHS = Chinook salmon, KOK = Kokanee, LMB = Largemouth bass, SMB = Smallmouth bass, BG = Bluegill, MWF = Mountain whitefish, BT = Bull trout, YP = Yellow perch, NP = Northern pike.

[b]July 1, 1993 opening day at Anderson ponds, bass ponds, Goose pond, and the pond west of Highway 30.

Table 24. Results of spot creel checks performed at Region 4 waters during 1992, excluding opening day.

Location	Anglers	Hour Fished	Fish[a] Caught								
			HRB	WRB	CHS	KOK	LMB	SMB	BG	YP	WE
Anderson Ranch Reservoir	25	147.5	14		1	124					
Big Smokey Creek	2	1	8								
Big Wood River	23	48		15							
Hagerman WMA	76	96	135				11		2		
Lake Cleveland	13	43.5	13								
Magic Reservoir	76	142	48								
Lower Salmon Falls Reservoir	14	33	22				1		15		
Roseworth Reservoir	8	32.5	2								
Salmon Falls Creek Reservoir	221	710	95	3		115		2		251	18
Stone Reservoir	4	32.5	11								
Sublett Reservoir	7	5		4							

[a]HRB = Hatchery rainbow trout, WRB = Wild rainbow trout (including hatchery fingerlings), CHS = Chinook salmon, KOK = Kokanee, LMB = Largemouth bass, SMB = Smallmouth bass, BG = Bluegill, YP = Yellow perch, WE = Walleye.

Table 25. Number and success of fishing tournaments in Region 4, 1990-1992.

Water	Number of tournaments	Total anglers	Hours fished	Largemouth bass no	Largemouth bass no/h	Largemouth bass Ave. wt (kg)	Smallmouth bass no	Smallmouth bass no/h	Smallmouth bass Ave. wt (kg)	Other	harvested
Anderson Ranch Reservoir											
1990	8	148	1,619				339	0.21	0.64		14
1991	5	91	855				149	0.17	0.60		0
1992	2	15	143				50	0.35	0.48		0
Salmon Falls Creek Reservoir											
1990	1	10	100				4	0.04	0.36		0
1992[a]	1	27	152				5	0.03	0.46	RB,WA,KO	27
Lower Salmon Falls Reservoir											
1990	3	57	503	74	0.15	0.95	3	0.01	0.82		0
1991	7	90	729	122	0.17	1.00					
1992	7	81	625	74	0.12	0.91	1		0.97		0
Upper Salmon Falls Reservoir											
1990	3	21	140	6	0.04	1.00	28	0.20	0.68		0
1992	1	8	68	10	0.14	1.24	10	0.14	0.86		0
Milner Reservoir											
1992	1	21	189				12	0.06	0.84		0
Perrine Coulee											
1990	1	450	900							RB[b]	300
Wood River											
1992	1	7	72							RB[c]	0

[a]Largest fish harvest tournament for smallmouth bass, walleye, rainbow trout, and kokanee.
[b]Rainbow trout stocked for kids tournament.
[c]Fly fishing catch-and-release tournament.

Percent of tags returned for fish planted in 1992 ranged from 0% for Fall Creek fish planted on August 10, to 20% for Little Wood River fish planted on June 8 (Table 26). Total percent return of tags generally increases after the second fishing season in waters with significant carryover of fish planted in the previous year.

RECOMMENDATIONS

Monitoring of kokanee spawning trends and population densities in Anderson Ranch Reservoir should be continued as water levels permit. Stocking of hatchery kokanee should be continued until densities of naturally-produced kokanee reach sustainable fishery levels.

Consideration should be given to treating Blair Trail Reservoir to remove stunted bluegill and brown bullhead.

Continue to work with irrigation companies to achieve viable minimum pool levels in reservoirs.

Table 26. Catchable trout jaw tag data for Region 4 waters during 1992.

Location	Date released	Fish size (no/kg)	Tags released	Tags returned	Percent
Salmon Falls Creek	05/01/90	8.6	100	11	11
Reservoir	09/16/91	5.5	300	63	21
Emerald Lake	11/19/91	5.9	100	8	8
Dog Creek Reservoir	04/19/91	5.5	150	33	23
Lower Salmon Falls Reservoir	09/12/91	7.2	300	30	10
Rock Creek City Park	08/09/91	8.8	50	5	10
	09/29/91	6.8	50	8	16
Malad River	08/07/91	8.5	50	12	24
Little Wood River	04/22/92	7.5	100	11	11
Richfield	05/19/92	7.5	100	12	12
	06/08/92	7.5	100	20	20
	06/26/92	7.2	100	2	2
Little Wood River	04/22/92	7.5	100	10	10
Shoshone	05/19/92	7.5	100	12	12
	06/08/92	7.5	100	13	13
	06/26/92	7.2	100	3	3
Fall Creek	05/21/92	7.5	100	16	16
	06/10/92	7.5	100	6	6
	06/30/92	6.8	100	5	4
	08/10/92	7.0	100	0	0

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A P P E N D I C E S

Appendix A. Roseworth Reservoir reclamation project memo.

State of Idaho
Department of Fish and Game
Region 4, Jerome

December 1, 1992

M E M O R A N D U M

TO: **Al Van Vooren**

FROM: **Chuck Warren and Fred Partridge**

SUBJECT: Roseworth Reclamation Project

Roseworth (Cedar Creek) Reservoir was assessed for fish species composition in October 1992 after a complaint was received from a fisherman in September 1992 that undesirable nongame fish species were becoming a nuisance. This assessment was carried out by sampling fish with one sinking and one floating gill net and one trap net set overnight and by electrofishing with power on for one hour during darkness. These efforts resulted in sampling (percent of total) 441 (44%) Utah chub, 223 (22%) bridgelip sucker, 316 (32%) redside shiner, and 17 (2%) rainbow trout. With these fish sampling results, and due to the fact that the drought had reduced the total water volume to probably less than 5% of its volume when full, Region 4 Fishery Management staff decided that Roseworth should be treated with Rotenone this fall before it freezes.

In complying with Department and state regulations, permission was acquired from the Idaho Department of Health and Welfare, Division of Environmental Quality to treat the reservoir with Rotenone, with the provision that no water would be released from the reservoir until it was detoxified with time and that adjoining land owners and water users be notified of the project. The project was therefore coordinated with the Cedar Creek Canal Company in order to make sure that there would be no water releases from the reservoir until next spring. The Bureau of Land Management and individuals grazing livestock next to the reservoir were also notified, with no objections voiced from any of them. There was also a public hearing held on October 23, 1992 at a KMVT Television Station conference room for the purpose of answering any questions and to receive comments the public might have concerning the project. As it turns out, the Regional Fishery Manager, Regional Fishery Biologist, and Dr. Wesley Rose, Fish and Game Commissioner, were the only attendees at the meeting with no members of the general public showing up. There were, however, two or three inquiries received over the telephone at the Region 4 office from individuals requesting more information concerning the project.

The Lake Renovation Procedures Manual (Horton 1991) was closely adhered to for most of the project for volumetric calculations, equipment acquisition and use, and Rotenone application. The total reservoir water volume two days prior to treating was estimated to be approximately 330 acre-feet, with its volume increasing significantly daily with at least 6.0 cfs of water coming in from tributaries. Rotenone toxicity tests were made five days prior (November 13) to treating to determine the minimum concentration required for a complete kill with the Rotenone on hand. This testing was done with a sample of 2.5% synergized Rotenone which had been on hand for several years and with a new lot of 2.5% synergized Rotenone. The toxicity tests revealed that a minimum of 4 ppm of the

Appendix A. Continued.

old Rotenone was required to kill sucker and chub within 30 min, using Roseworth Reservoir water with a temperature of 1°C, and it took a minimum of 3 ppm of the new Rotenone to kill sucker and chub within 1 h and 4 ppm to kill them in 20 min under the same conditions. Using all 190 gal available of the old and 255 gal of the new Rotenone, Roseworth Reservoir was treated at a rate of 3.5 ppm to 4 ppm on November 18. This includes 8 gal to 10 gal, which was applied at a drip station in Cedar Creek, 1/4 mi upstream of where it crosses the highway (at least 1 mi upstream of the reservoir's current water level), 2 gal to 2.5 gal applied in House Creek at the high water line (approximately 1/4 mi upstream of Cedar Creek), 25 gal applied in Reynolds Creek near its source (below reservoir high water line) and approximately 10 gal of a Rotenone-sand mixture applied to various small Reynolds Creek and Cedar Creek springs. The reason 25 gal were applied in Reynolds Creek was because 5 gal of potassium permanganate ($KMnO_4$) were inadvertently applied to the stream during the course of the treatment process.

Total manpower effort expended on the treatment date included 13 Department persons, who spent approximately 8 h on the site and traveling. This included several individuals not directly associated with the Fisheries Bureau. Not included, but also present at the site, was Larry Hovey, Twin Falls Times-News outdoor writer, who wrote a feature article in the newspaper on the project. As a result of these efforts, the entire project went smoothly, with the inadvertent use of the $KMnO_4$ in the tributary being the only minor glitch. It is believed that the additional Rotenone used in that tributary compensated for any detoxifying of the $KMnO_4$.

Success of the treatment in terms of killing all or nearly all of the fish will not be known until we can sample again sometime next spring. There were observed, however, numerous dead or dying fish floating near the surface by the end of the day.

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JOB PERFORMANCE REPORT

Name: Regional Fishery Management Investigations

State of: Idaho Project

Title: Region 4 Rivers and Streams Investigations

No: F-71-R-17

Job No.: 4-c

Period Covered: July 1, 1992 to June 30, 1993

ABSTRACT

Fish sampling in the Big Wood River indicated good numbers of wild rainbow trout Oncorhynchus mykiss at three sites, two of which are in reaches that have undergone regulation changes. Population estimates for fish of 200 mm or greater meet or exceed estimates for all the same sites sampled prior to regulation changes. In the lower reach downstream of Hailey, decreased percentages of fish exceeding 300 mm and 400 mm, compared to 1986-1988 sampling, may be a result of recent low water conditions.

The Jarbidge River was examined for the presence of bull trout Salvelinus confluentus at numerous sites throughout its reach in Idaho. Although no bull trout were found during the study, habitat was found to be suitable for supporting them. Incidental sightings within Idaho and the documented presence of a population in the headwater reaches in Nevada indicate the possibility of a migratory fluvial population.

Vineyard Creek fish were sampled with Idaho Department of Health and Welfare Division of Environmental Quality personnel in an ongoing project to assess impacts from non-point source pollution. Willow Creek fish were sampled on the Ashcraft property in another ongoing project to monitor recovery of the fishery after riparian fencing.

Less intensive investigations were made on Loving Creek within the Hayspur Fish Hatchery property, Twin Creek within the Elkhorn Subdivision, and on Quigley Creek. Loving Creek was snorkeled to document the status of the fish population. Twin Creek was restocked with brook trout S. fontinalis from Quigley Creek and wild rainbow trout from downstream of Big Wood River water diversions after a fish kill in June 1992.

Authors:

Fred E. Partridge
Regional Fishery Manager

Charles D. Warren
Regional Fishery Biologist

OBJECTIVE

To maintain information for fishery management activities and decisions for rivers and streams.

METHODS

Stream habitat data was collected using ocular and measurement techniques described by Idaho Department of Fish and Game (IDFG) (1992). Fish sampling gear included a Smith-Root Model 15-A backpack shocker and/or a Coffelt Model VVP-15 shocker powered by a 5,000-watt generator mounted in either a canoe or drift boat. The crew waded while shocking fish in all streams surveyed in 1992. Population estimates were made using either a Seber-LeCren two step or an adjusted (Chapman) Petersen mark and recapture estimate (Seber and LeCren 1967, Ricker 1975). Variances, standard error, and confidence intervals were determined according to Chapman (In Ricker 1975) so size group estimates could be pooled. Visual observations while snorkeling were used in some streams to identify fish species present, abundances, and approximate length frequencies.

Water temperatures (°C) were monitored at two sites on the Little Wood River above the Richfield Diversion and at Preacher Bridge between May 5 and October 22, 1992 with Ryan TempMentor digital recording thermographs. Thermographs were programmed to record temperatures every 30 min. Daily mean temperatures were calculated from the 48 daily measurements, along with daily minimum and maximum temperatures.

RESULTS

Big Wood River

The Big Wood River was no exception to reduced flows during the ongoing drought in southern Idaho. In 1992, low flows and irrigation demand resulted in the entire river being dewatered at the Bellevue Diversion instead of the Glendale Diversion, drying up an additional 4 km of river. It is unlikely that this section has been dewatered since the late 1930s. When the flow was diverted on August 13, 1992, IDFG employees and volunteers salvaged approximately 950 wild rainbow trout Oncorhynchus mykiss, 50 hatchery rainbow trout, 100 mountain whitefish Prosopium williamsoni, 3 brown trout Salmo trutta, and 2 brook trout Salvelinus fontinalis from this reach. The fish were released back into the river at the gravel pond below the Hulen Meadows Road north of Ketchum.

Population Estimates

Fish populations were evaluated at four electrofishing sites on the Big Wood River in September and October 1992 to monitor changes from highway construction and new fishing regulations (Warren and Partridge 1994). The four sites included three sites (2, 4, and 6) used by Thurow (1990) and the highway channel reach (6A), established in 1991, adjacent to site 6 (Figure 1). Site 6, in addition to being a monitoring control for the highway channel evaluation is also the only site having the same fishing regulations (catch-and-release) from 1986 to 1988 as at present. Regulations in site 2 changed from the general six trout limit to two trout with a 305 mm to 405 mm slot. Site 4 went from general regulations to catch-and-release.

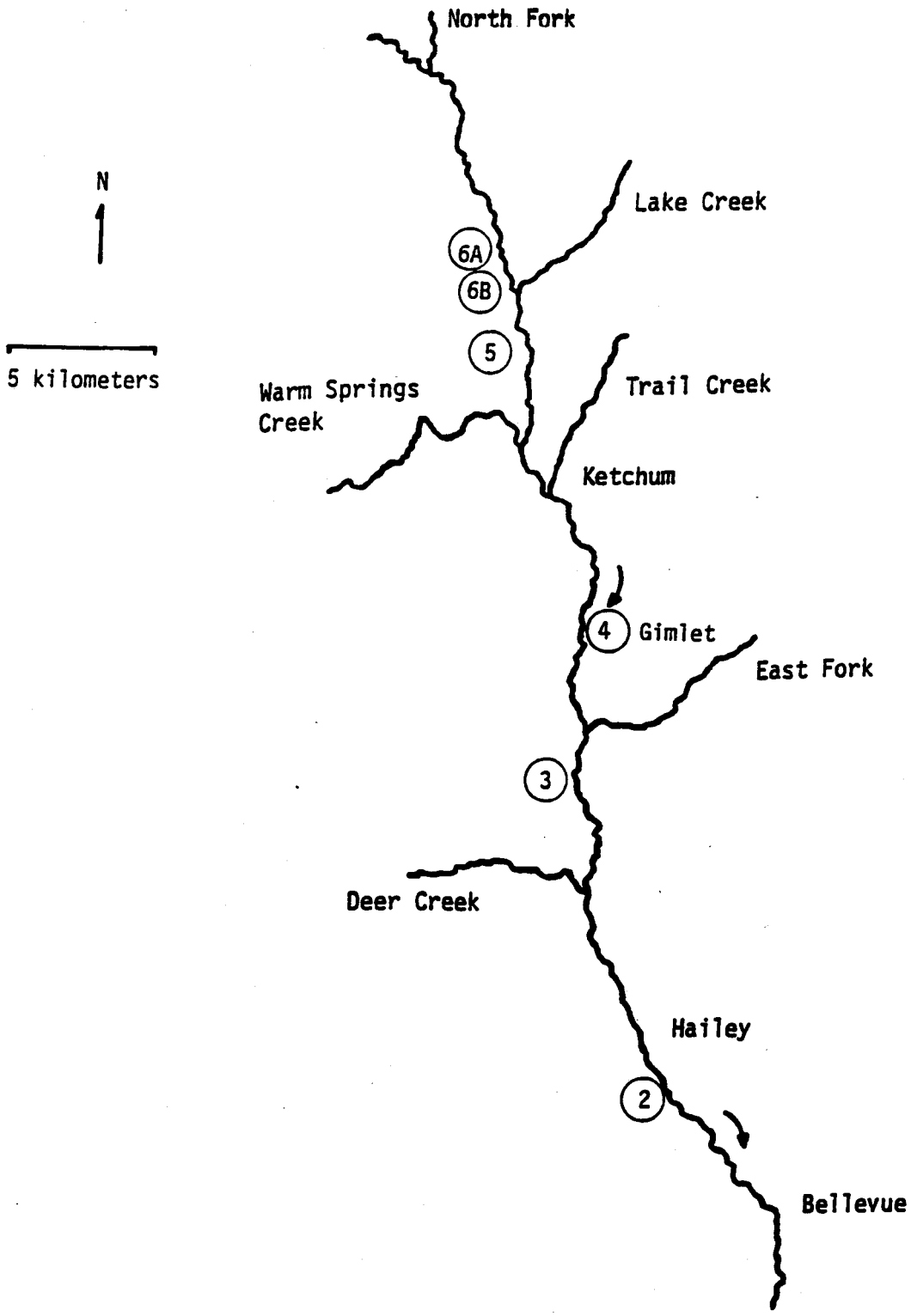

Figure 1. Map of Big Wood River with electrofishing sites (Thurow 1990).

As in 1991, fish population estimates were made by wading downstream with Coffelt electrofishing equipment in a canoe. A modified Petersen recapture estimate was made on all game fish of 100 mm or greater, except in sites 2 and 4. In these sites, due to the large numbers of 100 mm to 199 mm wild rainbow trout, only wild rainbow trout of 200 mm or greater were marked and measured. Total lengths on all other game fish were measured, except where noted. Estimated length frequencies for non-measured fish were calculated from a measured subsample from the reach or the closest adjacent reach. Nongame fish that were netted incidentally were counted. Population estimates were made both by combining 100 mm size class estimates and also by pooling all mark, capture, and recapture numbers for all fish of 200 mm or greater to compare to estimates made by Thurow (1990). Density estimates were based on reach areas (sites 6 and 6A) measured in either 1991 (Partridge and Warren 1994) or 1988 (site 2) (Thurow 1990). Site 4 was reduced in length to 1,120 m (2.2 hectares) due to low water access.

A total of 3,388 fish, consisting of 2,425 wild rainbow trout, 249 hatchery rainbow trout, 1 cutthroat trout O. clarki, 11 brook trout, 164 mountain whitefish, 513 Wood River sculpin Cottus leiopomus, and 25 bridgelip sucker Catostomus columbianus were collected and examined in reach 2 (Hailey) during electrofishing runs on September 22 and October 1, 1992. Wild rainbow trout sampled ranged from 70 mm to 450 mm, with a mean of 206 mm for those measured (Table 1, Figure 2). The estimated population of wild rainbow trout of 200 mm or greater in this 2,000 m reach was 974 fish (3.31/100 m^2) (Table 2). Sufficient samples of hatchery rainbow trout and mountain whitefish resulted in population estimates of 338 (1.15/100 m^2) and 109 (0.37/100 m^2), respectively (Table 3). Approximately 300 to 400 hatchery rainbow trout are released every two weeks through mid-August in the sampling reach. Based on size class estimates for wild rainbow trout, 11% of the fish exceeding 200 mm in site 2 were of 300 mm or greater and 1% were of 400 mm or greater.

A total 1,371 fish, consisting of 1,041 wild rainbow trout, 1 hatchery rainbow trout, 8 brook trout, 68 mountain whitefish, 251 Wood River sculpin, and 2 bridgelip sucker were collected in reach 4 (Gimlet) on September 24 and October 5, 1992. Wild rainbow trout sampled ranged from 50 mm to 490 mm, with a mean of 271 mm (Table 4). The estimated population of wild rainbow trout of 200 mm or greater in this 1,120 m reach was 895 fish (4.06/100 m^t). The mountain whitefish population estimate was 96 (0.44/100 m^2). Of the fish of 200 mm or greater, 50% exceeded 300 mm and 13% were over 400 mm.

A total of 1,207 fish consisting of 924 wild rainbow trout, 4 hatchery rainbow trout, 33 brook trout, 38 mountain whitefish, and 208 Wood River sculpin were sampled in reach 6 (Lake Creek) on September 11 and 17, 1992. Wild rainbow trout, which were not measured under 100 mm, ranged up to 470 mm (Table 5). The estimated population of wild rainbow trout of 200 mm or greater in this 1,149 m reach was 209 fish (1.29/100 m^2). No other game species were recaptured in sufficient numbers to estimate populations. Of the fish of 200 mm or greater, 29% exceeded 300 mm and 8% were over 400 mm.

A total of 1,906 fish, consisting of 1,549 wild rainbow trout, 3 hatchery rainbow trout, 15 brook trout, 78 mountain whitefish, and 260 Wood River sculpin were sampled in reach 6A (highway channel) on September 10 and 16, 1992. Wild rainbow trout ranged from 35 mm to 385 mm (Table 6). The estimated population of wild rainbow trout of 200 mm or greater in this 973 m reach was 113 fish (0.77/100 m^2). No other game species were recaptured in sufficient numbers to estimate populations. Of the fish of 200 mm or greater, 11% exceeded 300 mm and 0% were over 400 mm.

Although drought conditions reduced flows in the Big Wood River in 1992, wild rainbow trout numbers remained good with population estimates for fish of 200 mm or greater being the highest or near highest for sampling sites 2, 4, and

Table 1. Length frequency of game fish sampled in reach 2, Hailey, of the Big Wood River on September 22 and October 1, 1992. (Numbers in parentheses are estimated total of non-measured and measured fish.)

Total length (mm)	Wild rainbow trout	Hatchery rainbow trout	Brook trout	Cutthroat trout	Mountain whitefish
50					
60					
70	5 (17)				
80	6 (21)				
90	5 (17)		1		4
100	7 (220		2		15
110	16 (56)		1		16
120	34 (118				7
130	50 (174)				3
140	59 (205)				
150	82 (284)				
160	67 (233)				
170	72 (250				
180	54 (188)	1			
190	50 (174)	2	2		1
200	125	1			2
210	87	7	2		5
220	97	8	2	1	9
230	58	34			12
240	51	24	1		5
250	54	36			4
260	35	35			1
270	33	22			1
280	27	25			
290	17	18			
300	11	9			1
310	11	6			1
320	5	3			
330	6	6			
340	10				
350	10	4			2
360	3	4			2
370	6	2			2
380	6	1			6
390	2				2
400	2	1			7
410					8
420	2				2
430					7
440	4				6
450	2				5
460					3
470					
480					
490					
500					
Total	[a]1,171	249	11	1	[b]139
Mean	206.5	266.4	173.2	220	261.4

[a]An additional 1,254 wild rainbow trout <200 mm were not measured.
[b]An additional 25 mountain *whitefish* <100 mm were not measured.

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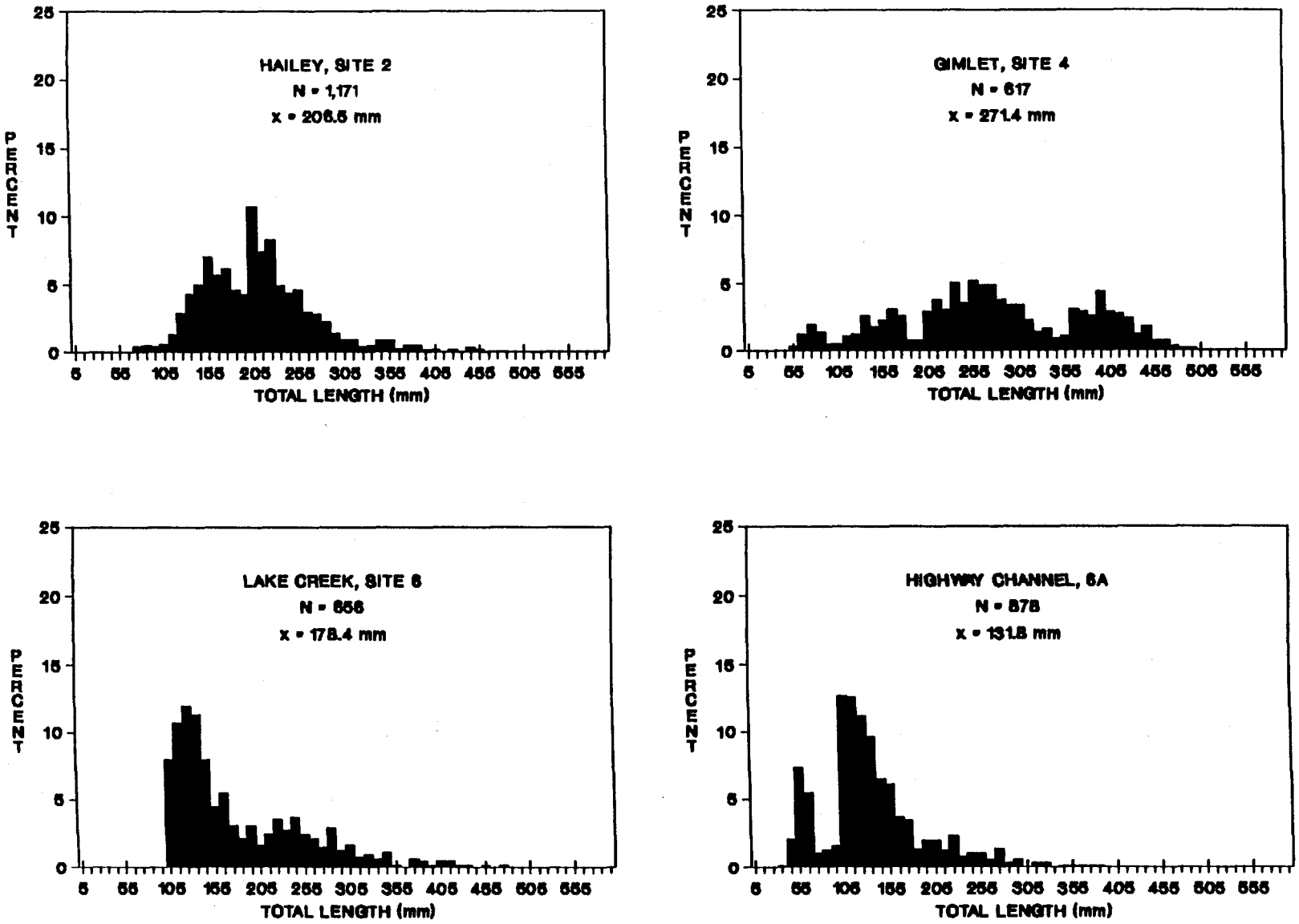

Figure 2. Length frequency of measured wild rainbow trout sampled by electrofishing in the Big Wood River, September and October, 1992.

Table 2. Population estimates of wild rainbow trout (> 200 mm) by size classes in the Big Wood River during 1992.

Reach/ size(mm)	Number marked	Number caught	Number recaptured	Population estimate	95% C.I.	No/ 100 m	No/ 100 m^2
Hailey, 2							
200-299	344	240	94	875	±136	43.8	2.98
300-399	44	26	12	93	±35	4.6	0.32
400-499	5	5	3	9	±5	0.4	0.03
Sum				977	±141	48.8	3.33
All > 200	393	271	109	974	±140	48.7	3.31
Gimlet, 4							
200-299	156	92	31	456	+126	23.0	1.56
300-399	88	59	15	334	+136	16.9	1.14
400-499	41	42	15	113	+42	5.7	0.38
Sum				903	+190	45.6	3.08
All > 200	285	193	61	895	±182	45.2	3.05
Lake Creek, 6							
100-199	206	239	62	788	+166	68.5	4.86
200-299	87	73	43	148	+28	12.9	0.91
300-399	24	18	40	43	±16	3.7	0.26
400-499	3	7	1	16	±16	1.4	0.10
Sum (> 200)				207	±35	18.0	1.28
All > 200	114	98	54	209	±36	18.2	1.29
Highway Channel, 6A							
100-199	302	294	116	764	+107	78.5	5.23
200-299	55	42	23	10	±26	10.3	0.68
300-399	8	3	2	12	±6	1.2	0.08
400-499	0	0	0	--			
Sum (> 200)				112	+27	11.5	0.77
All > 200	63	45	25	113	±28	11.6	0.77

Table 3. Population estimates of game fish (> 200 mm) other than wild rainbow trout by size classes in the Big Wood River during 1992.

Reach/ size(mm)	Number marked	Number cauaht	Number recaptured	Population estimate	95% C.L	No/ 100m	No/ 100 m^2
Hailey, 2							
Hatchery rainbow trout							
200-299	123	87	33	321	±83	16.0	1.09
300-399	21	14	10	30	±9	1.5	0.10
400-499	1	0	0	2	--	0.1	0.01
Sum				353	±84	17.6	1.20
All > 200	145	101	43	338	±74	16.9	1.15
Mountain whitefish							
200-299	27	11	8	37	±12	1.8	0.12
300-399	12	3	1	26	+21	1.3	0.09
400-499	24	14	7	47	+21	2.4	0.16
Sum				110	±32	5.5	0.37
All > 200	63	28	16	109	±32	5.4	0.37
Gimlet. 4							
Mountain whitefish							
200-299	9	13	4	28	±18	1.4	0.10
300-399	6	7	2	19	±14	1.0	0.06
400-499	15	10	3	44	±31	2.2	0.15
Sum (> 200)				91	±38	4.6	0.31
All > 200	30	30	9				

Table 4. Length frequency of game fish sampled in reach 4, Gimlet, of the Big Wood River on September 24 and October 5, 1992. (Numbers in parentheses are estimated total of non-measured and measured fish.)

Total length (mm)	Wild rainbow trout	Hatchery rainbow trout	Brook trout	Mountain whitefish
50	2 (8)			
60	8 (32)			
70	12 (49)			
80	9 (37)			
90	3 (12)		1	
100	3 (12)			1
110	7 (29)			1
120	8 (32)			2
130	16 (66)			1
140	11 (45)			
150	14 (57)			
160	19 (77)			
170	16 (66)			
180	5 (20)		3	
190	5 (20)			1
200	18			1
210	23		1	1
220	19		2	7
230	31			4
240	22			1
250	32			2
260	30			6
270	30		1	1
280	23			1
290	21			
300	21	1		
310	14			
320	9			3
330	10			4
340	6			
350	7			
360	19			1
370	18			
380	16			2
390	27			3
400	18			1
410	17			4
420	15			5
430	8			7
440	11			3
450	5			4
460	5			1
470	2			
480	1			
490	1			
500				
Total	[a]617	1	8	68
Mean	271.4	305	195.6	322.5

[a]An additional 424 wild rainbow trout <200 mm were not measured.

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Table 5. Length frequency of game fish sampled in reach 6, Lake Creek, of the Big Wood River on September 10 and 16, 1992. (Numbers in parentheses are estimated total of non-measured and measured fish.)

Total length (mm)	Wild rainbow trout	Hatchery rainbow trout	Brook trout	Mountain whitefish
30	(2)			
40	(29)			
50	(103)			
60	(78)		1	
70	(15)		2	
80	(18)		4	4 (16)
90	(23)		4	2 (8)
100	52		2	1 (4)
110	70		2	
120	78			
130	74		1	
140	52		1	1
150	29		2	
160	36		1	
170	20		2	1
180	14		1	1
190	20		2	
200	11		1	
210	16		1	
220	23			
230	18		1	
240	24		1	
250	16			
260	14	1	2	
270	10	3	1	2
280	19		1	
290	8			
300	11			1
310	5			
320	6			
330	4			
340	7			
350	1			
360				
370	4			
380	3			
390	1			
400	3			
410	3			
420	1			
430	1			
440				
450	1			
460				
470	1			
Total	[a]656	4	33	[b]17
Mean	178.4	271.2	150.8	202.0

"An additional 268 wild rainbow trout <100 mm were not measured. Length frequency estimates based on percentages in reach 6A.
[b]An additional 21 mountain whitefish <100 mm not measured.

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Table 6. Length frequency of game fish sampled in reach 6A, Highway Project, of the Big Wood River on September 10 and 16, 1992. (Numbers in parentheses are estimated of non-measured and measured fish.)

Total length (mm)	Wild rainbow trout	Hatchery rainbow trout	Brook trout	Mountain whitefish
30	1 (5)			
40	18 (91)			
50	64 (324			
60	48 (243			
70	9 (46)			1 (3)
80	11 (56)		5	13 (40)
90	14 (71)		3	7 (21)
100	111		1	2 (6)
110	110			
120	98			
130	84			
140	57			
150	53			
160	32		1	
170	30			1
180	12		1	1
190	17			2
200	17		1	
210	11			
220	20			
230	7	1		
240	9	1		
250	9	1	1	
260	5			
270	12			
280	3			
290	5			
300			1	
310	3		1	
320	3			
330				
340	1			
350	1			
360	1			
370	1			
380	1			1
390				1
400				1
410				
420				
430				1
Total	878[a]	3	15	31[b]
Mean	131.8	240.0	146.7	140.6

[a]An additional 671 wild rainbow trout <100 mm not measured.
[b]An additional 47 mountain whitefish <100 mm not measured.

6, compared to sampling in 1986 to 1988 (Table 7). However, the major impact on trout numbers from low flows may occur during subsequent winter months. Although size structure is not directly comparable between the 1986 to 1988 and 1990 to 1992 periods, due to variations in efficiency estimates and pooled estimates for sites in 1986 to 1988, the percentage of larger fish has remained stable or increased in most sites (Table 8). The percent of fish exceeding 300 mm and 400 mm in site 2 may have decreased from 1986 to 1988 levels, but until the raw data from the previous work is analyzed, it is difficult to determine. However, this site was also the most extensively drought-impacted electrofishing reach sampled in 1992. Site 4 showed the best numbers of larger fish, which is most likely due to changes in the regulations to catch-and-release and good deep holding water. Size structure in site 6 showed a slight increase in numbers of larger fish; however, there may have been some migration up into the area of bigger fish salvaged near Bellevue in August.

Trout Redd Counts

On November 19, 1992, an annual count of brown trout spawning redds in the Big Wood River above Magic Reservoir was made. A total of 43 redds were observed (Table 9). The number of redds observed was 50% of those seen in 1991. Drought conditions and reservoir drawdown are the most likely reason for low numbers.

On April 24, 1992, nine rainbow trout redds were observed in the Big Wood River below Magic Reservoir (Table 10). This was the same as seen in 1991, but down considerably from pre-drought conditions (Partridge and Warren 1994).

Jarbidge River

The Jarbidge River was studied by Region 4 Fisheries Management personnel in 1992 to assess the status of bull trout populations and habitat within the drainage in Idaho. The status of other fish species within the study area was noted as well. The study was conducted with the aid of a Bureau of Land Management (BLM) cost share challenge grant. The output for this project was a Bureau of Land Management Technical Bulletin describing the location, methods used, results, discussion, and other previous studies done on bull trout within the drainage (Warren and Partridge 1993).

In summary, no bull trout were observed or sampled at any of the study sites during the study on the Jarbidge River and its tributaries. They have been documented to be present in the headwater reaches by the State of Nevada (Johnson 1990) and sampled in the mainstem Jarbidge River by a Department biologist in 1991 (Charles Corsi, personal communication, 1991). Physical habitat appeared to be suitable for sustaining bull trout populations, although summertime low water temperatures were approaching or exceeding the maximum threshold of tolerance for most salmonid species. Due to warm water conditions found in the lower reaches of the Jarbidge River, it is speculated that any bull trout within the lower system would be fluvial and move upstream to headwater reaches for spawning and early rearing life stages. Other species sampled include wild redband rainbow trout, hatchery rainbow trout, mountain whitefish, bridgelip sucker, redside shiner Richardsonius balteatus, longnose dace Rhinichthys cataractae, speckled dace Rhinichthys osculus, mottled sculpin Cottus bairdi, and northern squawfish Ptychocheilus oregonensis.

Table 7. Estimated wild rainbow trout (> 200 mm) populations and densities in the Big Wood River. (Data from 1986-1988 is from Thurow [1990].)

Reach	Year	Season	Population estimate	95% C.I.	Trout/ 100 m	Trout 100 m
1	1986	Summer	235	168- 496	12.7	0.99
2	1986	Summer	352	218- 598	17.6	0.97
	1987	Summer	544	292-1,113	27.2	1.77
	1987	Fall	583	338-1,093	29.2	1.89
	1988	Summer	1038	749-1,483	51.9	3.53
	1992	Fall	974	834-1,114	48.7	3.31
3	1986	Summer	460	254- 920	43.1	2.11
	1986	Fall	81	42- 171	7.6	0.37
	1987	Summer	244	147- 433	22.9	1.37
	1987	Fall	220	128- 413	20.6	1.23
	1988	Summer	392	278- 569	36.7	2.32
	1991	Summer	547	350- 743	45.3	1.91
4	1986	Summer	675	431-1,898	34.1	1.97
	1986	Fall	455	258- 878	23.0	1.33
	1987	Summer	955	609-1,577	48.3	3.18
	1987	Fall	301	187- 512	15.2	1.00
	1988	Summer	808	601-1,111	40.8	2.76
	1992	Fall	895	713-1,077	45.2	2.97
5	1986	Summer	135	55- 338	11.4	0.76
	1987	Summer	111	58- 234	9.4	0.72
	1988	Summer	112	34- 204	9.5	0.76
6	1986	Summer	125	73- 235	10.9	0.72
	1986	Fall	168	107- 277	14.6	0.97
	1987	Summer	176	83- 405	15.3	1.04
	1987	Fall	161	97- 285	14.0	0.95
	1988	Summer	90	50- 180	7.8	0.54
	1990*	Fall	199	141- 289	12.1	0.86
	1991	Summer	132	94- 171	11.4	0.81
	1992	Fall	209	171- 243	18.2	1.29
6A	1991	Summer	126	63- 189	12.9	0.86
	1992	Fall	113	85- 141	11.6	0.77
7	1986	Summer	43	19- 108	4.0	0.32
	1987	Summer	20	10- 40	1.9	0.15

[a]Includes portion of old highway river site.
Section length estimated to be 1.65 km and area of 2.32 hectare.

Table 8. Estimated percentages and numbers of wild rainbow trout (>200 mm only) which exceeded 300 mm, 400 mm, and 500 mm in the Big Wood River. (Estimates from 1986-1988 adjusted for sampling efficiency [Thurow 1990).)

		Percent			Wild rainbow trout/km		
Year	Reach	> 300	> 400	> 500	> 300	> 400	> 500
1986-88°	2,3,4[a]	21	5	<0.1	76	17	0.2
1991	3	27	7	0	125	31	0
1992	2	10	1	0	51	9	0
1992	4	50	12	0	226	57	0
1986-88[a]	6	27	4	0.4	30	5	0.4
1990[b]	6	29	7	0	35	8	0
1991	6	21	5	0	23	5	0
1992	6	29	8	0	51	14	0
1991	6A	13	4	0	18	6	0
1992	6A	11	0	0	13	0	0

[a]Pooled data.
[b]Includes a portion of old highway river site.
Total sample length estimated to be 1.65 km.

Table 9. Brown trout redd counts on Big Wood River and Rock Creek above Magic Reservoir.

	Big Wood River[a]					Rock
Date	Area 1	Area 2	Area 3	Area 4	Total	Creek
Nov 19, 1986	--	26	-[b]	96	122	--
Nov 19,1987	102	62[c]	-[b]	30	196	--
Nov 15, 1988	13	75	31	39	158	--
Nov 18, 1988	6	20	33	8	67	1
Nov 20, 1990	1	25	30	14	70	0
Nov 15, 1991	3	30	38	15	86	0
Nov 19, 1992	5	14	9	15	43	0

[a]Area 1 – Rock Creek to Sheep Bridge
Area 2 – Sheep Bridge to fence at USGS gauge.
Area 3 = Fence to Stanton Crossing.
Area 4 – Stanton Crossing to Davis Pond.
Rock Creek – Highway 20 to mouth.

[b]Combined with previous reach.

[c]A total of 42 female brown trout were trapped from this section and spawned at Hayspur Hatchery.

Table 10. Rainbow trout redd counts on Big Wood River below Magic Reservoir.

Date	Magic Dam to Trestle	Trestle to Richfield Canal	Total
April 17, 1987	-	-	115
May 14, 1991	9	0	9
April 24, 1992	7	2	9

Little Wood River

Riparian vegetation on the Little Wood River between Silver Creek and Richfield has been modified in the past by removal of most larger shrubs and willows in attempts to increase flows of water down to irrigation canals. In addition, the area has been heavily grazed in the past. Grazing has been reduced in recent years with fencing; however, larger riparian vegetation is still in limited supply, which limits the amount of shade on the river. Because of limited shade, it was suspected that water temperatures during low flow periods may be limiting the fishery.

Ryan TempMentor digital recording thermographs were put into the Little Wood River immediately upstream of the Dietrich Canal diversion near the town of Richfield and at Preacher Bridge, approximately 10 km upstream of the diversion. The thermograph at Richfield was originally placed at the bridge below the diversion, but was moved above the diversion on May 19, 1992 to eliminate the influence of irrigation water from the Richfield Feeder Canal. The thermographs were programmed to record temperatures every 30 min for the period between May 5 and October 22, 1992. The thermograph at Richfield failed to produce reliable data after being checked the end of June.

The maximum water temperature observed in the Little Wood River was 26°C at the Preacher Bridge site on June 23, 1992 (Table 11). This correlated with an extremely warm period where air temperatures reached 37°C at Shoshone. Water temperatures remained cooler downstream at Richfield, with the maximum reaching 23.6°C on June 24, 1992. Daily extremes in water temperature were larger at the Preacher Bridge site, and maximum and mean water temperatures were predominately warmer than at the Richfield site. The combined mean temperature for the Preacher Bridge site was 16.2°C, with a minimum of 5.4°C during May 6 through October 21, 1992. At the Richfield site, which only operated properly from May 20 to June 25, 1992, the mean was 15.7°C and minimum 11.2°C. Daily maximum temperatures exceeded 19.0°C on an intermittent basis from May 6, when thermographs were installed, through August 23 at Preacher Bridge.

The combination of low drought related flows and high temperatures in the Little Wood River in 1992 probably resulted in significant loss of both brown and rainbow trout. In addition to actual losses of fish, the high temperatures can result in lower catch rates for brown and rainbow trout. McMichael and Kaya (1991) reported that when daytime water temperatures exceeded 19°C, catch rates became unsatisfactory.

Loving Creek

Waters from Loving and Butte creeks are used in the Department's Hayspur Hatchery. Historically, when this water was discharged it entered a 450 m canal parallel to the access road before reentering Loving Creek. In 1991, the old Butte Creek channel was cleared and widened to develop a more natural stream channel for the discharge water (Esselman et al. 1992). Water was turned into the new channel on August 27, 1991. Special regulations (two fish, none under 508 mm) were placed on this water to develop its trophy potential.

On May 12, 1992, the new and remaining portion of the old channel downstream from Hayspur Hatchery was surveyed for rainbow trout by two people snorkeling upstream. The stream was divided into five reaches based on natural changes of the channel. Reach 1 was from the trestle upstream to the old road culvert. Reach 2 was the pool area between two road culverts. Reach 3 extended

Table 11. Maximum, minimum, and mean daily water temperatures in the Little Wood River at Preacher Bridge and above the Richfield Diversion, 1992.

	Preacher Bridge Temperature (°C1			Richfield Diversion Temperature (°C1		
Date	Maximum	Minimum	Mean	Maximum	Minimum	Mean
05/06/92	19.0	14.1	16.5	19.4	16.3	18.0
05/07/92	19.2	14.6	17.0	19.9	16.7	18.5
05/08/92	17.4	14.7	15.7	19.1	16.0	17.8
05/09/92	14.6	10.5	12.3	15.9	13.4	14.1
05/10/92	15.5	11.8	13.5	14.3	11.9	13.1
05/11/92	15.2	12.0	13.6	14.4	12.1	13.2
05/12/92	14.8	10.8	12.9	13.5	11.2	12.6
05/13.92	16.8	12.3	14.5	15.7	12.0	13.9
05/14/92	17.6	13.1	15.5	17.4	14.0	15.8
05/15/92	17.0	14.1	15.6	17.2	15.3	16.3
05/16/92	17.8	13.3	15.5	17.7	14.7	16.2
05/17/92	18.2	13.8	16.1	18.0	14.9	16.6
05/18/92	18.6	14.4	16.5	18.7	15.9	17.5
05/19/92	19.4	14.3	17.1		Thermograph moved	
05/20/92	19.3	13.7	16.7	17.7	15.0	16.4
05/21/92	18.6	13.4	16.0	17.4	14.4	16.0
05/22/92	20.3	13.1	16.5	17.9	14.9	16.4
05/23/92	22.6	15.6	19.0	19.9	16.2	18.1
05/24/92	23.1	17.0	20.1	20.6	17.4	19.1
05/25/92	23.8	17.4	20.5	21.4	17.7	19.7
05/26/92	23.0	18.3	19.8	20.6	18.0	19.2
05/27/92	20.5	14.7	17.6	19.3	16.5	17.8
05/28/92	20.3	14.8	17.5	18.5	15.9	17.3
05/29/92	20.3	16.0	18.3	18.7	16.4	17.6
05/30/92	20.8	15.0	17.9	19.3	16.4	17.9
05/31/92	21.3	15.3	18.3	19.5	16.6	18.2
06/01/92	22.6	16.5	19.5	20.5	17.3	18.9
06/02/92	22.2	17.8	19.9	20.1	18.6	19.2
06/03/92	19.7	15.3	17.5	18.8	17.1	18.0
06/04/92	19.8	13.7	16.8	18.8	16.0	17.2
06/05/92	20.5	13.3	16.8	18.1	15.3	16.6
06/06/92	20.2	15.0	17.8	18.0	16.1	17.0
06/07/92	21.4	14.7	18.2	19.0	16.3	17.7
06/08/92	22.9	15.8	19.4	19.7	16.8	18.3
06/09/92	22.5	16.8	20.0	20.1	17.4	19.0
06/10/92	21.4	17.4	19.7	19.9	19.3	19.3
06/11/92	22.0	16.8	19.4	20.1	18.1	19.2
06/12/92	21.0	15.6	18.4	20.2	16.8	18.6
06/13/92	17.5	12.0	14.6	16.8	14.4	15.7
06/14/92	16.6	13.0	15.0	15.6	14.3	14.9
06/15/92	15.3	12.8	14.0	14.7	13.2	14.0
06/16/92	13.4	11.1	12.1	13.1	11.9	12.6
06/17/92	18.7	11.8	14.6	16.0	12.5	14.2
06/18/92	21.4	15.2	18.4	18.6	15.3	17.0
06/19/92	22.5	16.4	19.2	19.6	16.9	18.4
06/20/92	24.0	16.4	20.0	20.5	17.0	18.9
06/21/92	25.4	18.5	22.0	21.5	18.7	20.3
06/22/92	25.7	19.3	22.6	22.9	20.1	21.7
06/23/92	26.0	19.6	22.9	23.2	21.0	22.3

Table 11. Continued.

Date	Preacher Bridae Temperature (°C1 Maximum	Minimum	Mean	Richfield Diversion Temperature (°C1 Maximum	Minimum	Mean
06/24/92	25.1	20.2	22.9	23.6	21.2	22.3
06/25/92	22.9	19.3	20.9	22.2	19.9	21.2
06/26/92	ND	ND	ND			
06/27/92	ND	ND	ND			
06/28/92	ND	ND	ND			
06/29/92	ND	ND	ND			
06/30/92	16.9	15.3	16.1		Thermograph failure	
07/01/92	16.4	14.7	15.5			
07/02/92	17.3	14.1	15.6			
07/03/92	18.7	16.0	17.2			
07/04/92	19.2	17.5	18.6			
07/05/92	20.2	17.5	18.9			
07/06/92	19.4	17.9	18.7			
07/07/92	19.1	15.6	17.6			
07/08/92	18.9	16.8	17.8			
07/09/92	19.3	16.9	17.9			
07/10/92	18.7	16.8	17.7			
07/11/92	18.5	16.8	17.7			
07/12/92	18.6	16.2	17.2			
07/13/92	19.2	16.8	17.9			
07/14/92	19.8	18.0	18.7			
07/15/92	19.6	17.4	18.3			
07/16/92	20.7	17.8	19.0			
07/17/92	21.9	19.1	20.2			
07/18/92	21.9	18.3	20.5			
07/19/92	21.5	19.5	20.3			
07/20/92	22.0	18.8	20.1			
07/21/92	21.3	19.1	20.0			
07/22/92	21.2	18.7	19.7			
07/23/92	20.7	18.1	19.2			
07/24/92	20.3	16.8	18.5			
07/25/92	20.7	17.0	18.7			
07/26/92	21.4	17.2	19.1			
07/27/92	22.0	17.7	19.8			
07/28/92	22.8	18.6	20.5			
07/29/92	21.8	18.5	20.0			
07/30/92	22.4	17.8	19.9			
07/31/92	23.4	18.7	20.9			
08/01/92	23.9	19.6	21.6			
08/02/92	23.8	20.0	21.7			
08/03/92	23.3	20.3	21.5			
08/04/92	22.5	18.6	20.4			
08/05/92	21.7	18.0	19.7			
08/06/92	21.2	17.7	19.2			
08/07/92	21.4	18.0	19.2			
08/08/92	21.3	16.5	19.0			
08/09/92	22.0	17.9	19.6			
08/10/92	21.8	18.0	19.8			
08/11/92	22.6	18.6	20.3			
08/12/92	23.5	19.0	21.0			
08/13/92	23.8	19.6	21.4			

Table 11. Continued.

Date	Preacher Bridge Temperature (°C) Maximum	Minimum	Mean	Richfield Diversion Temperature (°C) Maximum	Minimum	Mean
08/14/92	23.6	19.7	21.5			
08/15/92	22.6	20.2	21.3			
08/16/92	22.1	19.3	20.6			
08/17/92	23.1	19.1	20.8			
08/18/92	23.5	19.4	21.2			
08/19/92	22.9	19.5	21.0			
08/20/92	22.0	18.6	20.3			
08/21/92	21.7	18.6	20.0			
08/22/92	19.6	16.8	18.3			
08/23/92	16.9	14.4	15.7			
08/24/92	15.7	12.7	14.2			
08/25/92	15.3	12.2	13.6			
08/26/92	15.4	12.0	13.5			
08/27/92	16.2	12.6	14.1			
08/28/92	16.8	13.2	14.8			
08/29/92	17.4	13.5	15.2			
08/30/92	17.7	14.4	15.8			
08/31/92	18.3	15.2	16.3			
09/01/92	18.0	15.0	16.3			
09/02/92	17.6	14.6	15.9			
09/03/92	16.6	14.9	15.7			
09/04/92	17.4	14.9	15.8			
09/05/92	15.6	14.1	14.7			
09/06/92	15.2	13.3	14.0			
09/07/92	13.9	11.9	12.8			
09/08/92	13.9	12.1	12.8			
09/09/92	15.0	12.1	13.2			
09/10/92	15.6	13.0	14.1			
09/11/92	15.9	13.8	14.6			
09/12/92	15.6	13.4	14.3			
09/13/92	13.3	11.3	12.3			
09/14/92	11.3	9.6	10.6			
09/15/92	12.5	9.4	10.7			
09/16/92	12.8	10.3	11.5			
09/17/92	13.6	11.4	12.2			
09/18/92	13.9	11.8	12.6			
09/19/92	13.2	12.1	12.5			
09/20/92	13.9	11.6	12.5			
09/21/92	15.2	12.6	13.6			
09/22/92	16.2	13.6	14.6			
09/23/92	15.9	14.4	15.1			
09/24/92	14.8	12.4	14.0			
09/25/92	12.6	10.8	11.6			
09/26/92	12.0	10.0	10.9			
09/27/92	12.6	10.1	11.0			
09/28/92	12.8	10.1	11.2			
09/29/92	14.1	11.0	12.2			
09/30/92	14.7	12.1	13.1			
10/01/92	15.6	13.0	14.0			
10/02/92	14.6	13.2	14.0			
10/03/92	13.1	11.6	12.4			

Table 11. Continued.

Date	Preacher Bridge Temperature (°C) Maximum	Minimum	Mean	Richfield Diversion Temperature (°C) Maximum	Minimum	Mean
10/04/92	12.2	10.9	11.4			
10/05/92	11.6	10.4	10.9			
10/06/92	11.6	10.4	10.9			
10/07/92	10.6	9.2	10.0			
10/08/92	10.0	8.9	9.5			
10/09/92	9.7	8.0	8.9			
10/10/92	9.6	8.1	9.0			
10/11/92	10.5	8.8	9.7			
10/12/92	11.4	9.5	10.6			
10/13/92	11.3	9.7	10.7			
10/14/92	10.4	8.3	9.3			
10/15/92	8.2	5.8	6.9			
10/16/92	6.8	5.4	6.3			
10/17/92	7.9	5.6	6.7			
10/18/92	8.0	6.5	7.4			
10/19/92	9.1	7.1	8.2			
10/20/92	9.8	7.8	9.0			
10/21/92	10.3	8.7	9.7			

from the road culvert up to the new channel. Reach 4 was in the new channel up to the goose nest structure on the island, and reach 5 was from the island up to the upper end of the new channel.

A total of 106 rainbow trout were observed and classified by length range for all sites, with 42 being in the new channel (Table 12). During the survey, large amounts of filamentous algae were present in the new channel which restricted visibility and may have reduced numbers of fish observed. Thirty percent of fish observed were 306 mm or larger; however, none were over 508 mm.

Quigley Creek

Quigley Creek is a small stream entering the Big Wood River from the east near the town of Hailey. On July 6, 1992, two sites were electrofished with a backpack shocker to sample and remove trout for transplanting into Twin Creek in the Elkhorn Village of the Wood River Valley. Site 1 was 128 m long and located in the lower reaches of the stream 0.5 km upstream of the lower irrigation pond. Site 2 was 146 m long and located approximately 1.5 km upstream of the lower irrigation pond at the downstream end of the BLM property. All fish sampled at site 1 were identified to species, enumerated, and measured for total length (Figure 3, Table 13). An additional 68 brook trout of similar size were collected at site 2. A total of 124 brook trout, averaging 110 mm, were sampled and transported from both sites. No other species were sampled.

Twin Creek

Twin Creek is a tributary to Elkhorn Creek which flows into the Big Wood River approximately 1.5 km south of Ketchum, Idaho. Within Elkhorn Subdivision is a series of at least six small impoundments on Twin Creek. These ponds all appear to be less than one surface acre in size and constructed as part of the subdivision landscaping for aesthetic purposes.

On June 8, 1992, a fish kill was reported on the Elkhorn Subdivision ponds by one of the residents. District Conservation Officer, Roger Olson, investigated and found dead brook trout and wild rainbow trout in the ponds that day. Three days prior to the report of the fish kill, the ponds were treated for aquatic vegetation control with Cutrine Plus at levels toxic to fish. Roger Olson collected, identified, and measured 104 dead trout from the six ponds on June 8, 1992 (Table 14). An additional 24 brook trout and 47 wild rainbow trout, the largest being 480 mm, were retrieved on June 11, 1992. The Idaho Department of Health and Welfare Division of Environmental Quality (DEQ) was notified of the fish kill, who then advised the Sun Valley Elkhorn Association, who was responsible for the fish kill, to develop a mitigation plan to compensate for the fish kill. It was agreed by Sun Valley Elkhorn Association and the IDFG that Fisheries Management personnel would collect wild rainbow trout and brook trout within the Big Wood River drainage and transplant them into the ponds once the pond water was no longer toxic. A total of 87 wild rainbow trout, ranging in length from 60 mm to 150 mm, were transported from below the Big Wood River irrigation diversions, and a total of 124 brook trout, ranging in length from 60 mm to 180 mm, were transported from Quigley Creek on July 6, 1992. The SVEA paid the Department for the time and expense in restocking the ponds and for the estimated monetary value of fish killed in the ponds.

Table 12. Length frequency of rainbow trout observed by snorkeling in Loving Creek on May 12, 1992.

Length (mm)	Reach[a] 1	2	3	4	5	Total
0- 75	5	0	0	0	0	5
76-150	0	0	2	0	0	2
151-230	6	10	2	3	4	25
231-305	2	20	0	6	14	32
306-380	3	5	2	2	13	25
381-455	2	2	0	0	3	7
Total	18	37	6	11	34	106

[a]1 - Railroad trestle to first culvert.
2 - First culvert to second culvert.
3 - Second culvert to start of new channel (bend).
4 - Bend to island with goose nest structures.
5 - Island to end of new channel.

Table 13. Length frequency of brook trout electrofished at site 1 in Quigley Creek, July 6, 1992.

Total length (mm)	Brook trout
50	2
60	3
70	14
80	7
90	1
100	1
110	2
120	1
130	8
140	6
150	4
160	2
170	2
180	1
190	2
200	
Total	56
Mean	110

R4DJRPT.93

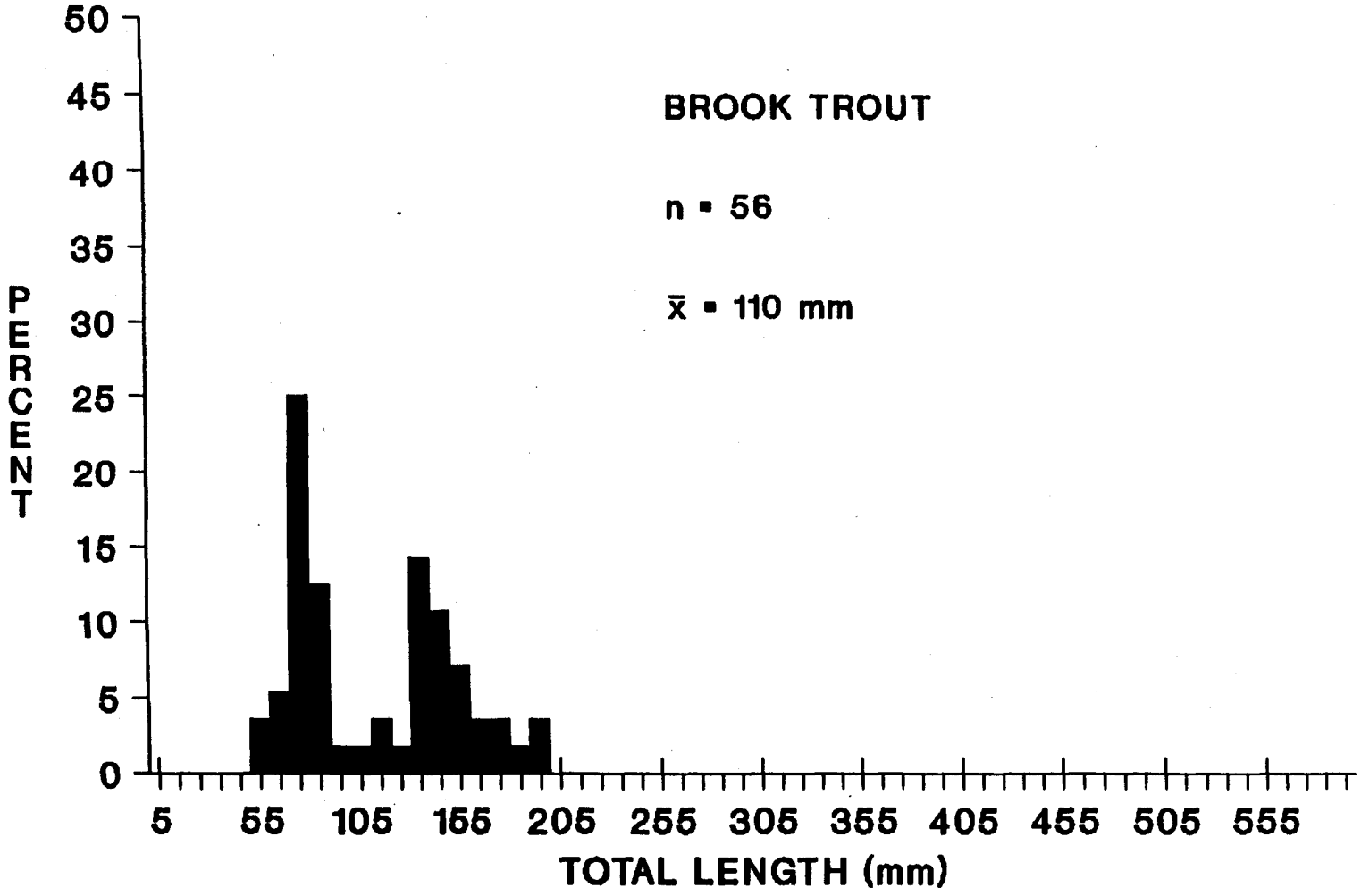

Figure 3. Length frequency of brook trout sampled by electrofishing at site one, Quigley Creek, July 1992.

Table 14. Length frequency of all dead trout collected from Elkhorn Subdivision ponds on June 8, 1992.

Total length (mm)	Brook trout	Wild rainbow trout
<140	2	27
140		
150	1	16
160		
170	2	14
180		
190		
200		11
210		
220	12	6
230		
240		
250	1	
260		
270		
280	1	2
290		
300	4	2
310		
320		
330		
340		
350	1	1
360		
370		
380		
390		
400		1
Total	24	80
Mean	228	172

Vineyard Creek

Vineyard Creek is a small spring-fed stream arising from a side canyon on the north side of the Snake River, 0.8 km upstream of Twin Falls dam (Sec 4, T10S, R18E). Water in the stream originates primarily from springs which flow several meters before entering Vineyard Lake. Water from the lake cascades over falls, then flows approximately 400 m to its confluence with the Twin Falls impoundment of the Snake River. The DEQ has been monitoring water quality and the aquatic community of Vineyard Creek for the last few years through the Idaho 208 Water Quality Management Program to monitor agricultural non-point source pollution and abatement (DEQ 1980). Vineyard Creek receives agricultural irrigation return flows from a ditch between Vineyard Lake and the mouth of the stream, which has formed a large sediment delta. Total discharge of Vineyard Creek on July 22, 1992 measured 0.370 m^3/s (13.05 cfs) between Vineyard Lake and the agricultural return ditch, and 0.458 m^3/s (16.17 cfs) near the mouth of the creek. Total discharge of the return ditch measured 0.072 m^3/s (2.55 cfs).

Region 4 Fisheries Management personnel occasionally assists DEQ in sampling fish in Vineyard Creek for this study. On July 23, 1992, salmonid species abundance and presence of other fish species were determined for three sites on the stream. Abundance was determined by the two-step removal method (Seber and LeCren 1967). Hybridization between cutthroat trout and rainbow trout is suspected to be extensive within the Vineyard Creek drainage, causing confusion over identification (Bob Bell memo to Idaho Department of Water Resources 1979). Abundance was therefore estimated for all trout collectively, although each fish sampled was classified as either one of the two trout species or as a hybrid.

Site 1 was located downstream of the irrigation return ditch. Game fish sampled at this site included 1 cutthroat trout and 3 smallmouth bass Micropterus dolomieu. A population estimate was not made for trout in this reach. Other species sampled include 5 common carp Cyprinus carpio, 3 largescale sucker Catostomus macrocheilus, 2 redside shiner, and 1 mottled sculpin. Sites 2 and 3 were located upstream of the irrigation return ditch. The population estimate for trout at site 2 was 24 ± 17, and for site 3 was 24 ± 12. Other species sampled included 1 smallmouth bass, 5 redside shiner, 2 mottled sculpin, 1 longnose dace at site 2, and 1 longnose dace at site 3. Total lengths were measured for all fish sampled (Table 15).

Willow Creek

Willow Creek flows southward out of the east side of the Soldier Mountains into Camas Creek, downstream of the Mormon Reservoir outlet. Fish populations in Willow Creek have been monitored by electrofishing since 1988 on the Marshall Ashcraft property. On June 8, 1992 fish were sampled at a 198-m trend monitoring site with a backpack shocker throughout most of the reach, and with the Honda generator and the Smith-Root VVP shocker at a beaver pond within the site. A total of 9 wild rainbow trout and 20 Wood River sculpin were sampled (Table 16). Mean total length of wild rainbow trout sampled was 197 mm. An estimate of population was not made due to the low numbers of trout sampled. On July 14, 1989, a total of 92 wild rainbow trout were sampled in the same site, with fry (23 mm to 37 mm) accounting for 93.5% of the sample (Partridge and Corsi 1990). In October 1990, a total of 127 wild rainbow trout averaging 106 mm were sampled in two passes with the backpack shocker within the same reach (Partridge and Corsi 1993). Sampling in July 1988 resulted in 150 wild rainbow trout averaging 104 mm in length, 81 brown trout averaging 87 mm, and 7 sculpin sp. (Partridge et al. 1990). November 1988 electrofishing at the same site resulted in sampling 56 wild rainbow trout averaging 109 mm in length, 11 brown trout averaging 111

Table 15. Length frequency of all fish sampled by electrofishing in Vineyard Creek, July 1992.

Total Length (mm)	Cutthroat trout	Wild rainbow Trout[a]	Hybrid cutthroat/ rainbow	Common Carp	Long-nose dace	Large-scale sucker	Mottled sculpin	Small-mouth bass	Redside shiner
70							3		
80									
90	3	2			1				2
100	1								
110	1								2
120			1		1				
130		1	2						
140		6	1						
150		2							
160									
170			1						
180	1	1	1						
190	2								
200		2							
210	3								
220	3								
230									
240		2	1						
250									
260									
270									
280									
290									
300		1							
310									
320									
330	1								
340	1								
350									
360									
370									
380									
390									
400									
410				2					
420									
430									
440									
450									
Total	16	17	7	5	2	3	3	4	7
Mean	189	166	161	418	100	405	75	232	98

[a]A11 trout collected may be cutthroat/rainbow trout hybrids.

Table 16. Length frequency of wild rainbow trout and subsample of Wood River sculpin sampled by electrofishing on Willow Creek, on June 8, 1992.

Total length (mm)	Wild rainbow trout	Sculipin
50		1
60		3
70		1
80		5
90		2
100		
110		
120		
130		
140		
150	1	
160	1	
170		
180	1	
190		
200	2	
210	3	
220	1	
230		
240		
250		
Total	9	12
Mean	197	77

mm in length, and 7 sculpin sp. The brown trout sampled in 1988 most likely originated from a hatchery release near the sample site in May of that year. The low numbers of trout sampled in 1992 can possibly be attributed to the timing of the sampling. There were no trout sampled of less than 150 mm in 1992, which were too long to be young-of-the-year. Average lengths of fish sampled later in the year during previous years were much smaller with most recognized as fry (Partridge and Corsi 1990).

Flows within this reach were observed to become intermittent in August 1988, leaving only a few small pools in the sample reach (Partridge et al. 1990). This site is therefore most likely used primarily as early rearing habitat.

RECOMMENDATIONS

Monitor fall downstream movement of trout along the Idaho/Nevada border in the Jarbidge River to document current stream use by bull trout.

Work with BLM and volunteer groups to reestablish natural shrubs and trees along the Little Wood River to help reduce water temperatures.

ACKNOWLEDGEMENTS

Fisheries technicians Christie Cockerham, Chris Wright, and Robert Dischinger collected field data and assisted with data summarization and analysis. Conservation officers, regional and research staff also assisted with the collection of data. Senior Fishery Research Biologists Jeff Dillon and Greg Mauser organized and coordinated the Big Wood River fish salvage on short notice.

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JOB PERFORMANCE REPORT

State of: Idaho **Name:** Regional Fishery Management Investigations

Project No: F-71-R-17 **Title;** Region 4 Technical Guidance

Job No.: 4-d

Period Covered: July 1, 1992 to June 30, 1993

ABSTRACT

Region 4 Fishery Management personnel furnished 54 written comments of technical guidance to other agencies and private individuals and organizations. A considerable amount of time was spent reviewing projects and developing comments and plans. Stream alterations on the Big Wood River and tributaries required more time than other activities. Committee meetings and tours relating to Snake River water quality issues, along with hydropower proposals, also required a significant amount of time.

Many miscellaneous activities were commented on, participated in, or otherwise addressed, and numerous meetings regarding fisheries were attended.

Author:

Fred E. Partridge
Regional Fishery Manager

OBJECTIVE

To furnish technical assistance, advice, guidance, and comments to other agencies, organizations, or individuals regarding any items, projects, or activities associated with or potentially affecting fishery resources and habitat in the region.

METHODS

Reviews, field inspections, comments, expertise, and recommendations were furnished to all governmental agencies, private organizations, and individuals upon request. We participated in meetings, tours, and gave presentations when requested or necessary. The addition of a regional environmental coordinator during the year reduced the amount of time required from the fishery staff in commenting directly on the numerous habitat-related projects in the region.

FINDINGS

Region 4 Fishery Management personnel responded to the following number of written requests from various agencies and individuals:

Idaho Department of Water Resources	28
Environmental Protection Agency	2
Bureau of Land Management	1
U.S. Corps of Engineers	3
U.S. Forest Service	2
Idaho Department of Lands	2
U.S. Fish and Wildlife Service	1
Outfitters & Guides	2
Miscellaneous	13
TOTAL	54

Miscellaneous Activities

1. Regional fishery staff provided information to Department Natural Resources Policy Bureau staff during the year on nine different existing and proposed hydropower projects. Time was spent at meetings, on site reviews, and preparing comments.

2. With the completion of the Highway 75 project north of Ketchum, time spent on this project was reduced to two meetings. However, fisheries in the new channel will continue to be monitored along with other sites in the Big Wood River.

3. We continued to participate in monthly meetings of the Middle Snake River Study Group until late in 1992, when the final plan was completed. The group, directed by Jerome, Twin Falls, Gooding, and Lincoln counties, was established to develop a program for restoring and managing the Snake River between *Milner* and Bliss dams.

4. Additional planning committees on the Snake River have been set up by Idaho Department of Water Resources and Idaho Department of Health and Welfare, Division of Environment Quality. We provided these committees with technical information and sat in on committee meetings.

5. Provided information to, and worked with, the IDFG Natural Resources Policy Bureau and the Idaho Department of Water Resources on water rights and minimum flows for Billingsley Creek, Niagara Springs, Clear Lake, Crystal Lake, and Scotts Pond.

6. Provided information to local fishing clubs and Idaho Power Company on fish habitat structure construction and placement in local ponds and Milner Reservoir. Assisted three clubs with structure projects.

RECOMMENDATIONS

Technical guidance on issues involving fishery resources in Region 4 should be continued to assist in maintaining fishery resources in Region 4.

Submitted by:

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Approved by:

IDAHO DEPARTMENT OF FISH AND GAME

Steven M. Huffaker, Chief
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